

Southern Power & Industry

The Industrial and Power Journal of the South and Southwest

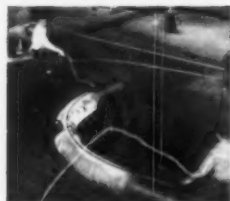
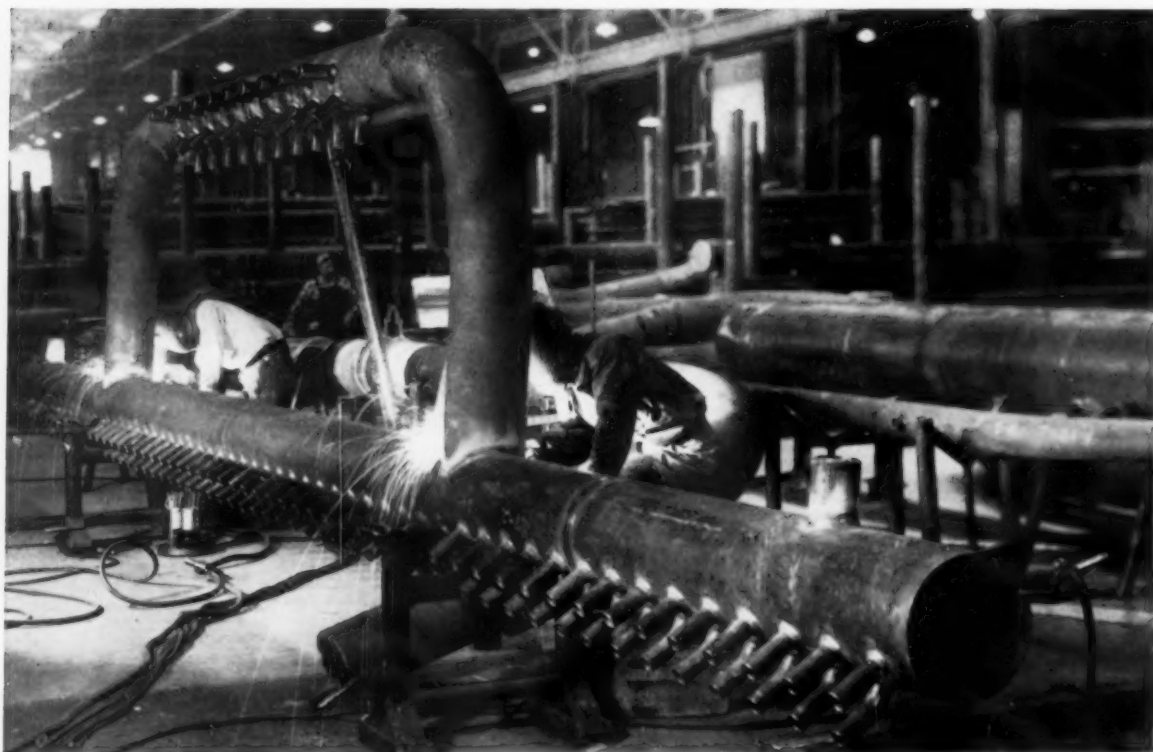
MAY, 1960



Maintenance

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EXACTLY as you want it . . .



Bending



Stress-relieving



Ultrasonic Testing

Shop-fabricated piping by Grinnell

With Grinnell shop-fabricated piping — cutting, fitting, welding, and assembly "on location" is reduced to an absolute minimum. That can be important. For when these operations are performed under the less-than-ideal conditions existing in the field, there is always the possibility of less-than-perfect results. For example, errors in cutting or fitting can occur — or welds can contain slight imperfections, which may be difficult to detect and correct with field equipment.

In Grinnell shops, on the other hand, whole sections of complex piping are assembled *exactly* as you want it — with every critical point checked with the latest equipment and by the most modern methods. When these sections arrive on site, they go up fast and *right*.

With Grinnell shop-fabrication too, there are no unforeseen costs. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. There are no charges for waste material.

Consider the quality of the finished job, and final cost. Then consult Grinnell on *your* next piping installation.

To Engineering Societies and Departments: A 30-minute color sound film showing the quality and economy of Grinnell Shop-Fabrication of all classes of piping is available without charge. Contact your local Grinnell Supply Sales Office, or write to Grinnell Company, Inc. 216 West Exchange St., Providence, R. I.

GRINNELL

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Grinnell Company, Inc., Providence, Rhode Island

Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

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Volume 78

Number 5

MOGUL IS TOPS IN TENNESSEE TOO!

NASHVILLE

KNOXVILLE

MEMPHIS

SOUTH PITTSBURG



- ★ **MEMPHIS** . . . As a member of the Alsonett chain of hotels, Hotel King Cotton serves Western Tennessee with its 200 guest rooms and complete banquet facilities. MOGUL is used in treating the hotel's cooling tower and boiler systems.
- ★ **NASHVILLE** . . . Like many of today's modern buildings, The Life and Casualty Tower, tallest commercial structure in the southeastern U.S., is fully air-conditioned. The entire air-condition water system, including algae control, plus all boiler water is treated with MOGUL.
- ★ **SOUTH PITTSBURG** . . . The U.S. Stove Company, leading manufacturer of cast iron and steel heaters (Gas, Oil and Solid fuel), uses MOGUL to condition the sludge and prevent build-up of hard deposits in the plant's wet type dust collector system.
- ★ **KNOXVILLE** . . . This plant of The Palm Beach Company, a famous name in the clothing industry for many years, uses MOGUL and Mogul Service to protect their boilers and steam and return lines.

The North American
MOGUL

Products Company

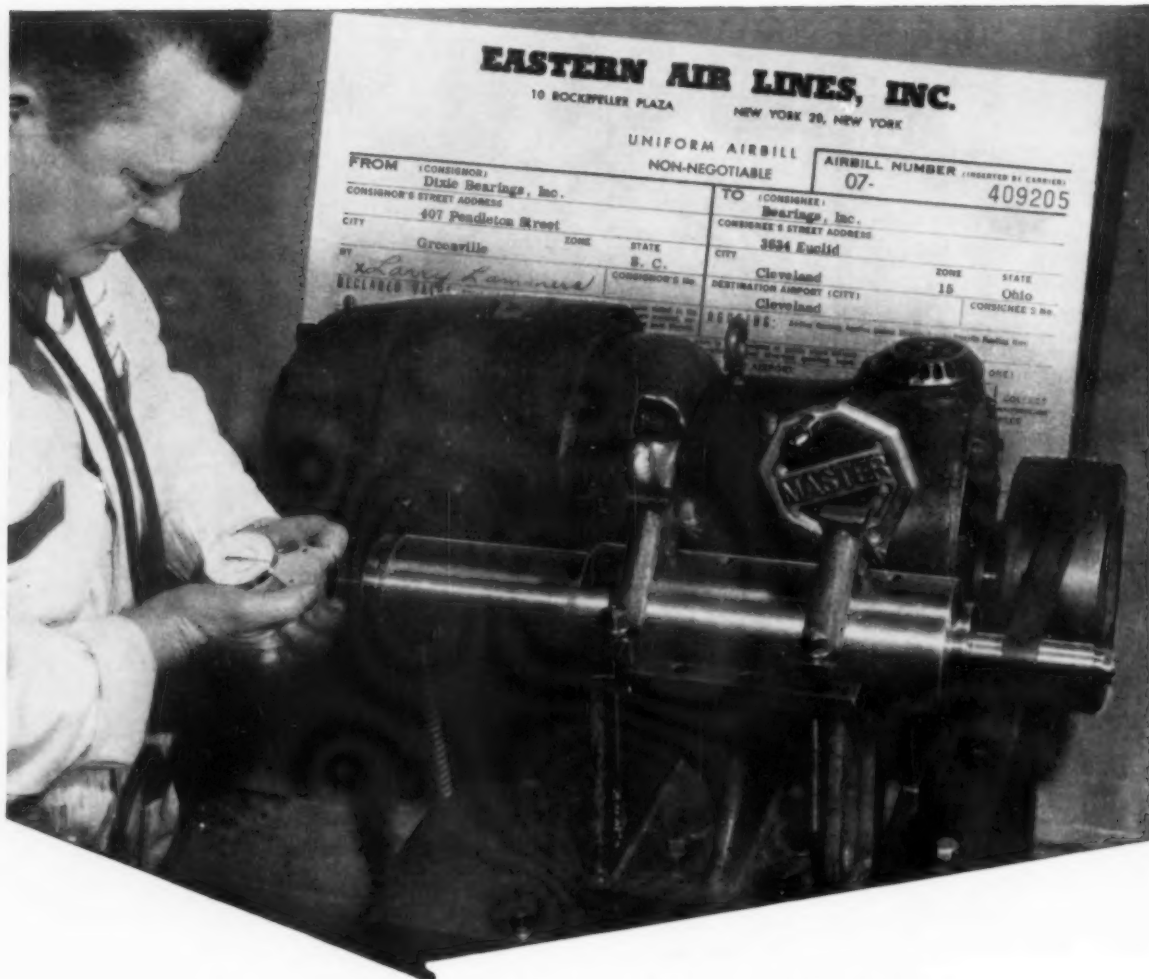
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In the South, and in all parts of the country, thousands of institutions, schools, colleges, hospitals, public buildings and industrial plants of all types are MOGUL-IZING their operating equipment with Mogul Quality Products and Mogul Service. These MOGUL users are assured of complete protection from the damaging effects of water. In addition to fact-finding surveys, periodic inspections, consulting service, water analyses (all supplied without charge to MOGUL users), MOGUL offers a complete water treatment program with performance results guaranteed. MOGUL-IZING is the answer to more efficient operation of your equipment through "personalized" treatment of your specific water problems.

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their shop early Sunday. By working all day Sunday, the spindles were back in Greenville and in operation on Monday morning!

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in the South*

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LOUISIANA: Baton Rouge • New Orleans • **N. CAROLINA:** Charlotte • Greensboro
S. CAROLINA: Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville
VIRGINIA: Norfolk • Richmond



Southern Power & Industry

The Industrial and Power Journal of the South and Southwest

Eugene W. O'Brien
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MAY, 1960

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SOUTHERN POWER & INDUSTRY for MAY, 1960

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Facts and Trends

May 1960

- ◆ **WATER COOLED BUS**—The cooling by water of an isolated-phase generator bus has been tested in the laboratory of Delta-Star Electric Division, H. K. Porter Company, Inc. The 19-in. diameter circular aluminum bus, enclosed in a 40-in. aluminum duct, was of 10,000 ampere capacity.

With the forced cooling 15,000 amperes were kept flowing through the bus while bus temperature rise was held within allowable limits. Ordinary tap water was recirculated through the bus at different temperatures and rates of flow while bus temperature rise was constantly checked. The circulating water was cooled in a refrigerating unit. It was possible to use tap water for the test because the voltage was low.

- ◆ **NOT FOR EDITORS**—Man's first inhabited space station may be packed in a small container as it leaves the earth, blown into shape like a balloon when it reaches orbit, and "rigidized" by quick-setting plastic foam.

All this is possible through the use of expandable coated fabric structures, according to Goodyear Aircraft Corporation engineers who developed the material for applications in space technology. The fabrics, either of organic or metallic fibers, will be able to withstand high temperatures, extreme cold and the hard vacuum of space. Space stations envisioned by GAC engineers will be enormous earth-circling expandable structures situated hundreds of miles above the earth where men will be able to work with scientific instruments and live in comfort.

- ◆ **WRITE BY TELEPHONE**—Comptometer Corporation is now marketing a line of Electrowriter instruments which transmit written messages or sketches to any point, however distant, over telephone or radio circuits.

The transmitting party merely writes with a ball point pen on plain or form paper. As the pen is moved, the remote receiver or receivers instantly and faithfully reproduce the copy as it has been written. Any number of Electrowriter instruments, in any desired combination, any distance apart, can be interconnected. No extraneous power supplies are required. The instruments are self-contained and fully transistorized.

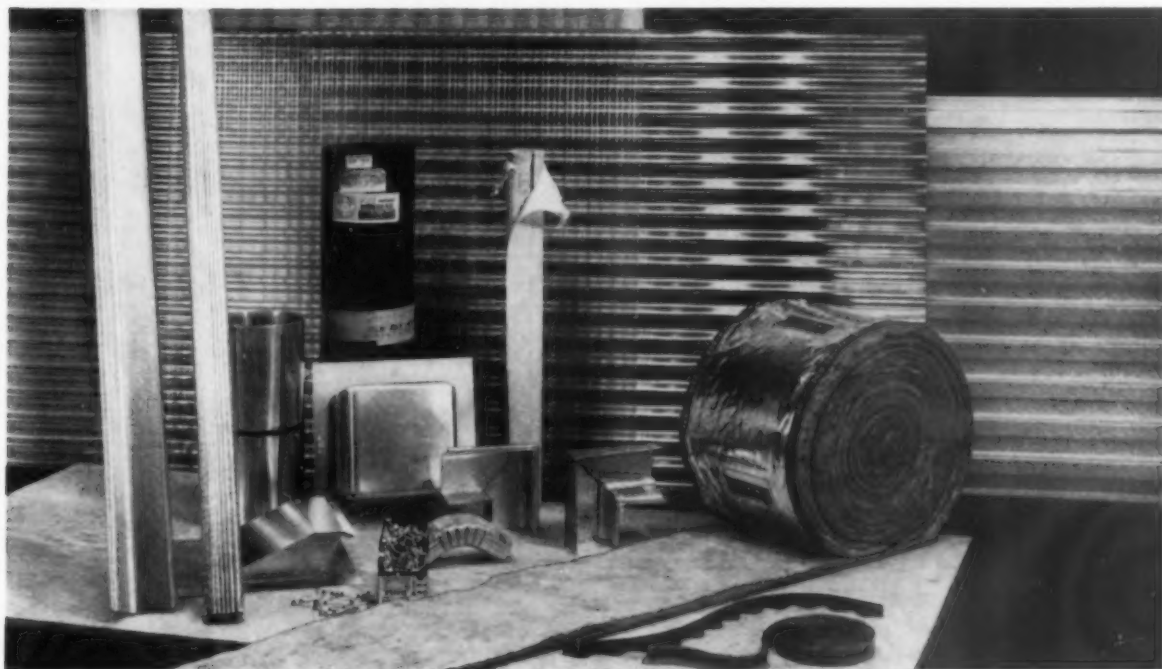
- ◆ **WORKMEN'S COMPENSATION**—In some states an employer can go to jail for ignoring his state's workmen's compensation law. In many states he can be stopped from doing business. In most states he can be fined. The laws vary. What's the law in your state?

To help employers learn how to conform to the workmen's compensation laws, the Chamber of Commerce of the United States published its 1960 biennial revision of "Analysis of Workmen's Compensation Laws." The 57-page booklet includes the latest changes in U. S. state and federal laws. For a copy of the booklet send \$1 to the Insurance Department, Chamber of Commerce of the United States, 1615 H St. N. W., Washington 6, D. C.

- ◆ **LET THOSE THAT GET BENEFIT PAY**—Local governments, in their search for non-tax revenue to meet rising costs and to provide expanded programs, have greatly increased their use of charges for services such as municipal recreation facilities, housing,

(Continued on Page 6)

You get excellent service and supply from
Reynolds Aluminum Supply Company on



Building Repair Products

One of the best ways to cut time and cost corners on building repair and other maintenance jobs is to have a reliable "one-stop" source for the many products needed. Ten Reynolds Aluminum Supply Company warehouses provide this service. When spring "fix-it" time demands a keg of nails, a sheet of aluminum or galvanized roofing, a roll of insulation . . . or any of a hundred different repair products, your orders can be quickly filled and expedited through your nearest RASCO branch.

Big inventories give you a broad choice of types and grades of materials and assure that your needs will always be met. Other RASCO plusses include modern materials handling equipment and our own fleet of trucks.

For full information on the materials and service you can get from Reynolds Aluminum Supply Company, contact the warehouse nearest you.

Each of Reynolds Aluminum Supply Company's ten Building Repair Product Centers carries complete stocks of Aluminum Roofing and Siding, Gutters, and Downspouts, Stylux Fiberglass Panels, Ventilators, Insulation, Flashing, Stainless Steel, Nails, Plywood, Insulation Board, Hardboard and many other materials needed in repair work.

Reynolds Aluminum Supply Company is your ONE-STOP source of supply for all these products.



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Facts and Trends (Continued)

school lunch programs and hospitals, the National Industrial Conference Board reports in a study released today.

In 1940, total general revenues which local governments collected from their own sources were \$5 billion, and charges and miscellaneous revenues accounted for only 10 per cent of the total. By 1957, total revenue had climbed to \$18 billion, and charges and miscellaneous revenues were bringing in 20 per cent of it. The cities that charge more for such services also spend more and tax less.

- ◆ **ALUMINUM MINE CARS**—A year-and-a-half test of 10 aluminum mine cars in a West Virginia coal mine indicates that the aluminum cars can cut mine operating costs and withstand rugged service, Reynolds Metals Company reported recently.

The 17-ton cars, put into service in the fall of 1958, weigh nearly 50 per cent less than comparable steel cars. This saving in weight means that mine trains can pull up to 10 per cent more loaded cars per train, without increasing gross train weight. Manufactured by Watt Car and Wheel Company, Barnesville, Ohio, the cars were designed by Reynolds Metals Company's Product Development Department. After a year and a half's service the cars today show no signs of corrosion, although they have been used to haul coal, slate, clay, wet sand and cement.

- ◆ **THERMOELECTRIC GENERATOR**—With scores of firms now engaged in the race to make thermoelectric power generation (direct conversion of heat into electricity) a commercial reality, General Instrument Corporation has placed on the market a small (one-foot high), lightweight (10 pounds), automatic "power plant" with no moving parts, that can produce electricity for a year on \$10 worth of ordinary propane gas and will keep running as long as the fuel supply lasts.

The new generator (which employs "thermopiles" of semi-conductor elements to convert the heat of the burning propane into electricity and will cost about \$500) produces five watts of power, steadily and continuously, for as long as the fuel supply lasts.

- ◆ **COAL-GAS TURBINE**—A generating cycle combining a steam turbine and a gas turbine, to be installed in an Ohio power plant, will be used for the first time in the production of electric energy by a coal-burning plant. This will be accomplished by installation of a 5000 kilowatt prototype turbine, driven by coal gas, at the Muskingum River Plant of the Ohio Power Company.

Previously, gas turbines used for power production have burned only natural gas and distillate and bunker C oils. The 5000-kw prototype will operate in this manner: coal, broken down by high temperature in a carbonizer, will yield both gas and char. The gas will be burned in the gas turbine. The hot exhaust from the gas turbine will be fed with the char into a cyclone-type burner firing into the pulverized coal-fired boiler.

- ◆ **BASIC RESEARCH**—A scientific breakthrough that opens the door to understanding a major life process has been achieved in the Du Pont Company's fundamental research work. For the first time researchers have duplicated in a test tube the reaction nature uses within a living cell to create the nitrogen compounds without which no life can exist.

They have discovered a technique, long sought by scientists around the world, by which nitrogen-fixing chemicals can be separated from bacteria and stimulated to perform their function outside the bacterial cell. Lacking such a technique, scientists have been frustrated in their research on this vital natural process.

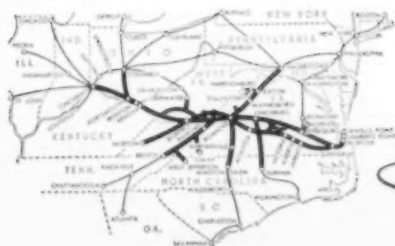
(Continued on Page 8)

The New N&W . . .



NATION'S GOING-EST RAILROAD!

- ▶ America's newest fleet of diesel locomotives . . . 529 units with average age only 2.5 years.
- ▶ 81,006 modern freight cars — more per mile of line than any other major U. S. railroad.
- ▶ Busiest large railroad . . . greatest freight traffic density.
- ▶ A 30% longer railroad with merger of the Virginian into Norfolk and Western. Wonderful new industrial sites.
- ▶ New, easier grades, more interchange points with other railroads.
- ▶ Now a billion dollars in assets.



This is why the dynamic, new Norfolk and Western means savings in time and money to shippers!

Norfolk and Western Railway

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FOUR PRINCIPLES FOR TRANSFORMER PAINTING

1. **Color.** There is a direct relationship between color and operating temperature. Subox paints are made in modern colors to meet *present-day peak load requirements*. They are available in standard grays, and also in decorator shades for color-styling in residential neighborhoods.
2. **Film Thickness.** When repeated coats of paint build up on a transformer they tend to act as a blanket and hold the heat in. With Subox paints, *fewer coats are needed* and internal heat is more efficiently dissipated.
3. **Long Life.** The paint on a transformer is subject to wide temperature changes. *All Subox paints contain suboxide of lead*. This unique pigment remains chemically active even after drying; builds a tough, fibrous film that maintains flexibility and does not crack, chip, peel or blister even under the most punishing conditions.
4. **Film Structure.** Aluminum-containing paints are often desired because they reflect sunlight; however, in conventional paints of this type the aluminum flakes overlap and leaf together to form an insulating barrier. In our Subalox paints, the polished aluminum flakes are non-leafing and do not overlap. Therefore, they promote both reflection and better radiation.

Leading electric utility companies use Subox paints for transformers. Write for color card and literature.

SUBOX PAINTS



Established 1924

6 Fairmount Plant
Hackensack, N. J.

Facts and Trends

(Continued from page 6)

WATER-LUBRICATED—The man who invented and perfected a new water lubrication system for motors that drive atomic reactor pumps was honored recently by the General Electric Company.

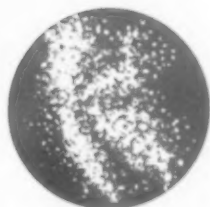
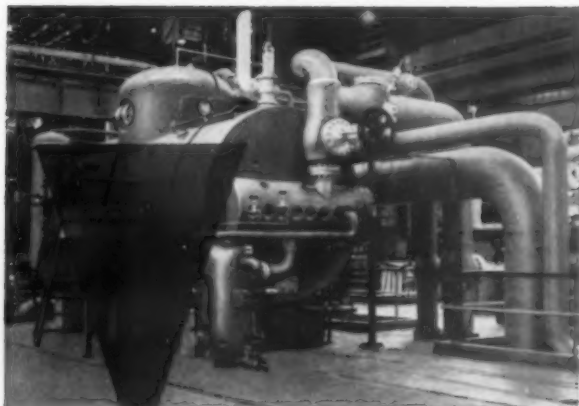
Erwin R. Summers, senior development engineer in G-E's Medium A-C Motor & Generator Department, was presented with a special Award of Merit, first ever given by the department. Mr. Summers directed the work of designing and building motor bearings to operate immersed in the pressurized, radio-active water that is the coolant fluid for atomic reactors used chiefly in naval ships.

THE NATIONAL Safety Congress is the biggest annual event in safety. Each year 12,000 delegates exchange ideas and discuss their problems. You can have the benefit of this experience.

All the records of the major happenings at the National Safety Congress . . . the talks, papers and panel discussions presented at each session are printed each year in 28 pamphlet-size volumes . . . a rich source of ideas for making speeches, writing articles, preparing safety bulletins, or for distribution to key personnel throughout your organization. The complete set of 28 volumes is offered for \$10.50. Individual papers are also available. Write National Safety Council, 45 N. Michigan Ave., Chicago 11, Ill.

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Southern Power & Industry
806 Peachtree St., N.E.
Atlanta 8, Georgia

WHEN INDUSTRY NEEDS WATER



**PURER THAN THE
DRIVEN SNOW**

**Yuba Evaporators
are achieving new record
high purities**

*Other Yuba products for
steam power plants include
Condensers, Feedwater Heaters,
Expansion Joints, Heaters,
Tanks, Cranes, Structural Steel
and scores of other items.*

In power, processing, marine or any industry that needs high purity water in volume, Yuba evaporators are recognized as the finest equipment available today. There are good reasons why. Recent tests by Consolidated Edison Company of New York show that purities better than 0.004 PPM total solids are achieved — purities "heretofore unknown." Heart of the Yuba evaporator is the patented improved bubble tray design. Yuba evaporators have reached their present peak because of continuous refinement of design, engineering and manufacturing. And Yuba's mechanical vapor purifier has also been found to be the most efficient of its type within the limits of mechanical purifier design.

Bubble tray or mechanical evaporators, Yuba designs are the most flexible in the industry. They can be installed vertically or horizontally—in a wide capacity range—depending on the industry need or basic plant design. Whatever your high purity water need, remember Yuba for the finest in evaporators. Write today for the complete story of tests on Yuba equipment — Bulletin YHT 101.



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SOUTHERN POWER & INDUSTRY for MAY, 1960

For more information, use Reply Card—Page 85

9



the **SOUTH—SOUTHWEST**

more power . . . more plants . . . more money

Yale Rubber Mfg. Co. Builds Georgia Plant

A new half-million-dollar industrial plant is being built near **Dawson, Georgia**. E. H. Henderson, president and general manager of the **Yale Rubber Manufacturing Company**, announced.

The plant will produce molded and extruded rubber goods, oil seals and miscellaneous parts. The estimated cost of the plant and machinery is one million dollars.

Mr. Henderson said he expected the plant to begin operation in August of this year. Approximately 150 people will be employed initially, he continued, with possible future expansion calling for 250 to 300 employees.

The modern 60,000-square-foot concrete and steel structure will be the first industry to be situated in Dawson's new 225-acre industrial district. According to the plant's architects, Heery & Heery of Atlanta, the building is designed for expansion to a total of 160,000 square feet. It will be located on Georgia Highway 32 just west of the Dawson city limits and will be served by the Seaboard Airline Railroad.



Reynolds Aluminum Supply Company has announced the presentation of its annual Star Salesman Awards to three Warehouse Division salesmen. From left to right, standing, are: Dave Luton, Second in Profit Production; Joe Hogan, First in Gross Sales and Profit Production; and Joe Blair, Second in Gross Sales. Seated are Paul H. Fox, President of the firm and Rae E. Hasselbring, General Manager of RASCO's Warehouse Division.

Universal Atlas—Texas

Universal Atlas Cement Division of United States Steel Corporation is proceeding with a program of expansion and modernization at its cement plant in **Waco, Texas**. This program, scheduled for completion late in 1961, will double the present plant capacity.

Built in 1929, the Waco plant produces gray Portland cement and masonry cement. It also produces a retarded oil-well cement with major markets in the Texas-Louisiana area. At present the Waco plant is a one-kiln operation. The company plans to install a second rotary kiln to provide a modern, fully integrated two-kiln operation with an estimated capacity of over 2,000,000 barrels of finished cement. A special feature will be the installation of a complete glass-bag filter system.

U. S. Concrete Pipe—Fla.

United States Concrete Pipe Company, wholly-owned subsidiary of Pittsburgh Coke & Chemical Company, has begun construction of a new \$2,500,000 vitrified clay pipe plant on a 40-acre tract at Ocala, Florida.

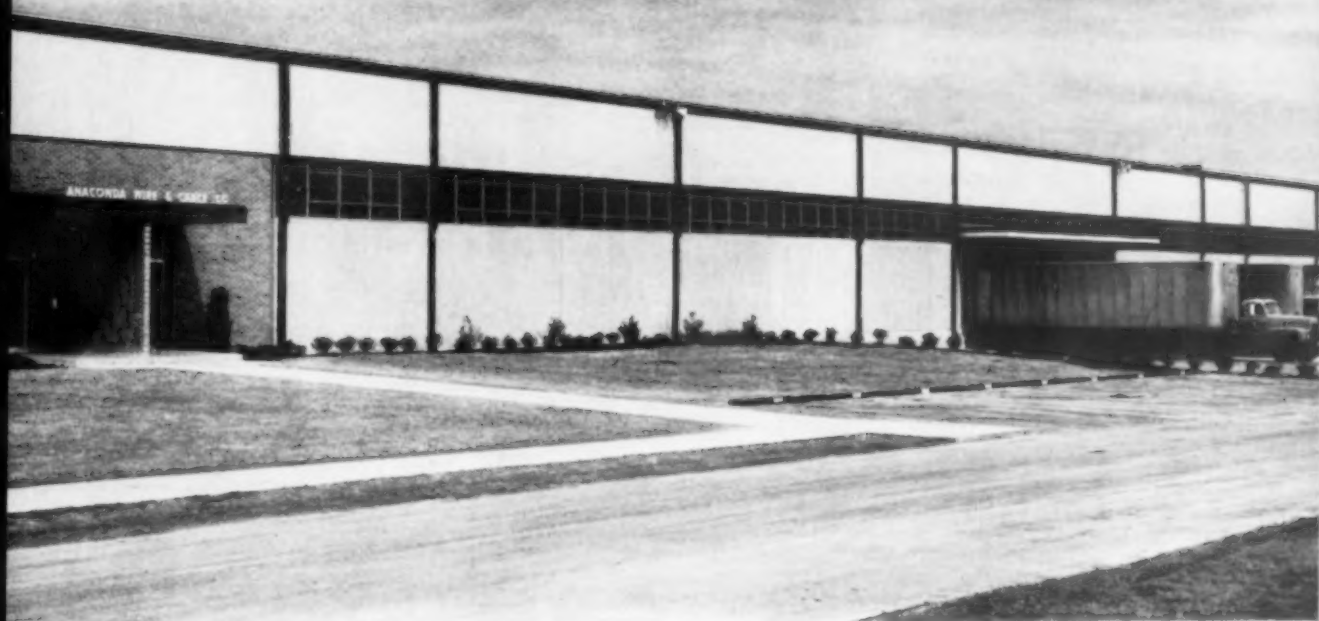
Included in the up-to-date facilities will be a tunnel kiln with preheaters, extrusion presses and joint fabricating equipment. Raw material for plant production will be purchased from clay producers in Alabama, where the company also recently acquired clay properties.

U. S. Steel—Ala.

U. S. Steel Supply Division awarded a contract to American Bridge Division of U. S. Steel for the construction of a steel service center in Birmingham, Alabama.

The facility, located at 21st Street and Avenue C, Ensley, Birmingham, will replace two older structures used by the Supply Division in that city.

Construction is scheduled to start this spring and to be completed late this year. The structure will feature overhead cranes, shearing, sawing and flame-cutting machinery.



The modern wire and cable plant to serve the dynamic South

We have served the South for many years, and we have been proud to share in this region's unprecedented growth.

Now, this new Anaconda Wire & Cable Company plant will provide the way to even better service — thanks to its modern manufacturing and storage facilities and central location.

In fact, everything in this operation has been designed to give you wire and cable products of highest quality and deliver them to you FAST by truck or rail.

In addition, the complete research and engineering facilities and the varied manufacturing skills of the

entire Anaconda Wire & Cable Company are available to — and stand behind — the new Watkinsville plant, an expression of Anaconda's pride to be part of the dynamic South.

Anaconda Wire & Cable Company Southern District Sales Offices

Charlotte, N. C.—Atlanta, Ga.—Birmingham, Ala.
New Orleans, La.—Tampa, Fla.

SEE THE MAN FROM
ANACONDA®
FOR ELECTRICAL WIRE AND CABLE



62-Foot Piping Assembly To Union Electric Co.

This 62-foot long hot reheat header, equal to the height of a six-story building, is one of the largest single pieces of fabricated piping ever produced west of the Mississippi River. It was fabricated by **Midwest Piping Company, Inc.**, St. Louis, for **Union Electric Company**

of Missouri's Meramec Station, Unit 4, where it was erected by Midwest field crews.

A single pole trailer with flagged escorts front and rear was used to transport the 15-ton piping assembly from the Midwest plant to the job site on the Mississippi River south of the city.

The header was fabricated in chrome-moly steel, has a 1½" wall thickness, and diameter 24" to 27".

Seiberling Plant — Ark.

Seiberling Rubber Co. is establishing a new plant in Arkansas as part of its current expansion program. Initially the Batesville plant will employ 100 and will produce shoe products and other rubber goods.

The project, with total valuation of \$1,300,000, is to be housed in a 100,000 sq. ft. building on a 20-acre site, with construction beginning this spring.

Bowater Board Mill—S. C.

Production of smooth-on-both-sides hardboard at the new \$7,000,000 plant of **Bowater Board Company, Catawba, S. C.**, is scheduled to get under way early in June, John G. Robinson, mill manager has announced.

The plant at Catawba has been designed to produce 160,000,000 square feet of hardboard a year with initial production going to the furniture industry. The company expects to expand marketing to other industrial users as soon as practicable.

The plant will have 125 employees with an estimated payroll of \$500,000

during the opening stages of operation.

The plant is situated next to the Bowaters Carolina Corporation pulp mill on the Catawba River. It is served by both the Southern and Seaboard railroads. Wood is obtained from the heavily-forested Piedmont areas of North and South Carolina.

Columbia-Southern—La.

Columbia-Southern Chemical Corporation has begun construction of an ethylene dichloride plant at the company's Lake Charles, La., facility.

According to Joseph A. Neubauer, president, the plant will cost in excess of \$1,000,000 and initial production is scheduled for September, 1960. The new unit will adjoin the firm's large chlorine and caustic soda manufacturing operation.

Production of this organic compound will mark Columbia-Southern's entry into chemicals based on ethylene. The process for the new plant was developed by the research and development department at Columbia-Southern's Corpus Christi operation.

FUTURE EVENTS of Engineering Interest

May 5-6: AIEE Annual Textile Conference, Heart of Atlanta Motel, Atlanta, Ga. Textile Industrial Subcommittee, American Institute of Electrical Engineers, R. R. Prechter, General Electric Co., Atlanta, Chm.

May 5-6: 1960 Protective Relaying Conference, Georgia Tech School of Architecture Auditorium, Director/Short Courses and Conferences, Georgia Institute of Technology, Atlanta 13, Ga.

May 9-13: 2nd Southwestern Metal Exposition & Congress, American Society for Metals, State Fair Park & Sheraton Hotel, Dallas, Texas. Allan Ray Putnam, Mgr. Dir., ASM, Metals Park, Novelty, Ohio.

May 11-14: 1960 Spring Meeting, Fluid Controls Institute, Inc., The Greenbrier, White Sulphur Springs, West Virginia. E. R. Rath, Exec. Sec'y, Box 667, Pompano Beach, Fla.

Sept. 7-15: 2nd Coliseum Machinery Show, Chicago Coliseum, Chicago, Ill. A. Byron Perkins, Exec. Mgr., 2807 Sunset Blvd., Los Angeles 26, Calif.

Duke Power to Install Allis-Chalmers Kaplans

The highest head Kaplan turbines ever built by Allis-Chalmers York Works are scheduled for installation in **Duke Power Company's** Cowan's Ford project near **Mt. Holly, North Carolina**.

The three 265-inch units are each guaranteed to develop 121,000-horsepower under a 92-ft head and 160,000-horsepower under the maximum head of 115 ft. It is believed that this will be the highest head Kaplan installation in the country.

The plant located on the Catawba River between Gastonia and Charlotte, is designed to operate almost exclusively to carry the high peaks of Duke Power Company's load. These peaks usually occur in August and December.

(Continued on page 96)



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Complete product identification and data on label attached to carton.



Vogt modular designed cartons give added handling and storage space economies. All dimensions are in multiples of 3 inches.



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Handling and inventory costs are held to a minimum with Vogt modular packaged forged steel fittings, flanges, and unions. The small cartons, of restricted weight, are appreciated by the distributor and user alike for their easy handling and the protection given the products against damage.

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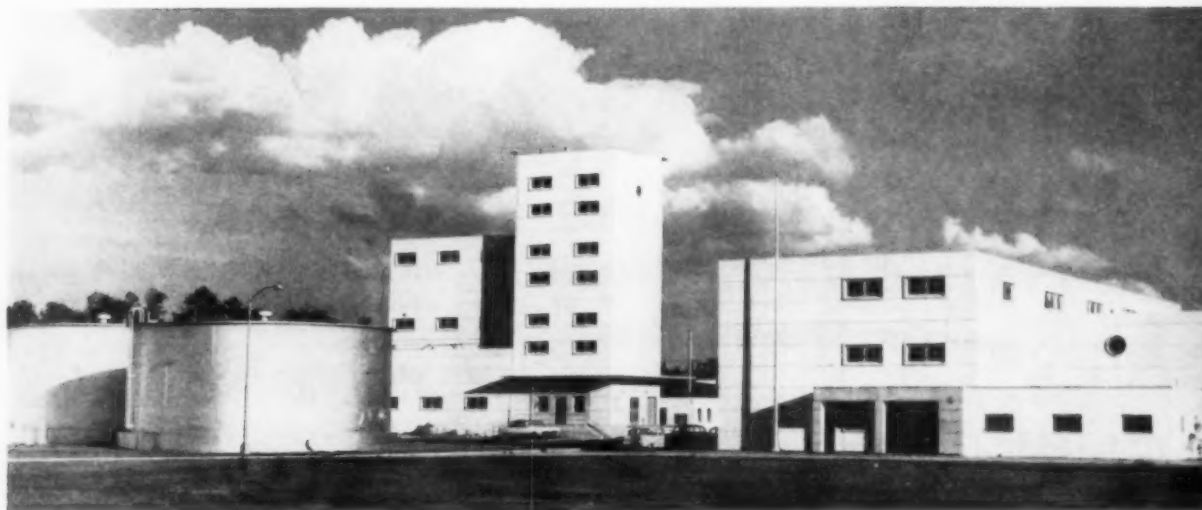
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H. T. Oberly, Superintendent of the Water Department, St. Petersburg, Florida, shown leaving the Municipal Water Works Building. The efficient, modern Cosme pumping station shown below is one of two serving the growing St. Petersburg area.



"The Westinghouse Inspection Contract is the best maintenance investment the city Water Department ever made"

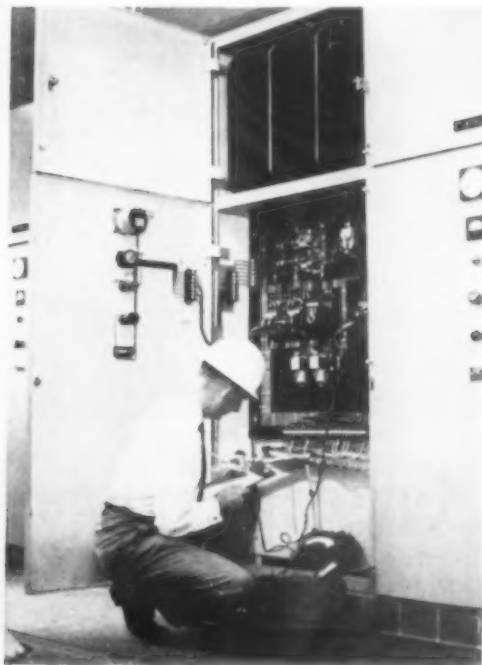
says Mr. H. T. Oberly, Superintendent of Water Works, St. Petersburg, Florida

During initial inspections at the two St. Petersburg Water Works pumping stations, Westinghouse Field Service Engineers discovered two serious problems. Without immediate action, these defects could have caused water shortage emergencies in the city. Insulating oil in a power transformer at one site had a dangerously high acid content . . . needed immediate filtering and retreating. In the second instance, a stand-by generator was found to have a grounded field coil. The unit has always been used in emergencies and during heavy electric storms. It is routine operation to switch to an emergency generator in these instances. It has a weekly hour's run if there have been no power failures.



Mr. Putnam, Supervisor of Washington Terrace station; and Roy Love, Westinghouse Field Service Engineer, check the layout of the transmission portion of the pumping station. Power coming into this substation is used to run the pumping equipment.

Westinghouse Field Service Engineer inspects, tests and makes minor adjustments on all the electrical equipment in one of the St. Petersburg pumping stations. Pictured is one of the thorough electrical checks on the control circuits.



The St. Petersburg Municipal Water Works signed up for the Westinghouse Maintenance Inspection Contract a little over a year ago to cover the Washington Terrace and Cosme pumping stations. In addition to exhaustive checks of the electrical system, the Westinghouse Field Service Engineer inspects all the electrical controls and rotating equipment. Mr. H. T. Oberly says it's the best maintenance investment his Water Department ever made.

You can now have a Westinghouse Field Service Engineer check and test all your electrical equipment under contract—weekly, monthly or yearly, depending upon your needs. Behind him he has the complete resources, research, engineering, man power and facilities of Westinghouse. These scheduled inspections, adjustments and recommendations can prevent equipment failure, reduce outages and down time to a minimum. Yet your cost is amazingly low . . . generally, much less than 1 percent of the value of your equipment.

For complete information, call your Westinghouse sales office or write: Westinghouse Electric Corporation, 1299 Northside Drive, N.W., Atlanta 2, Ga. (Available in the Westinghouse Southeast Region only.)

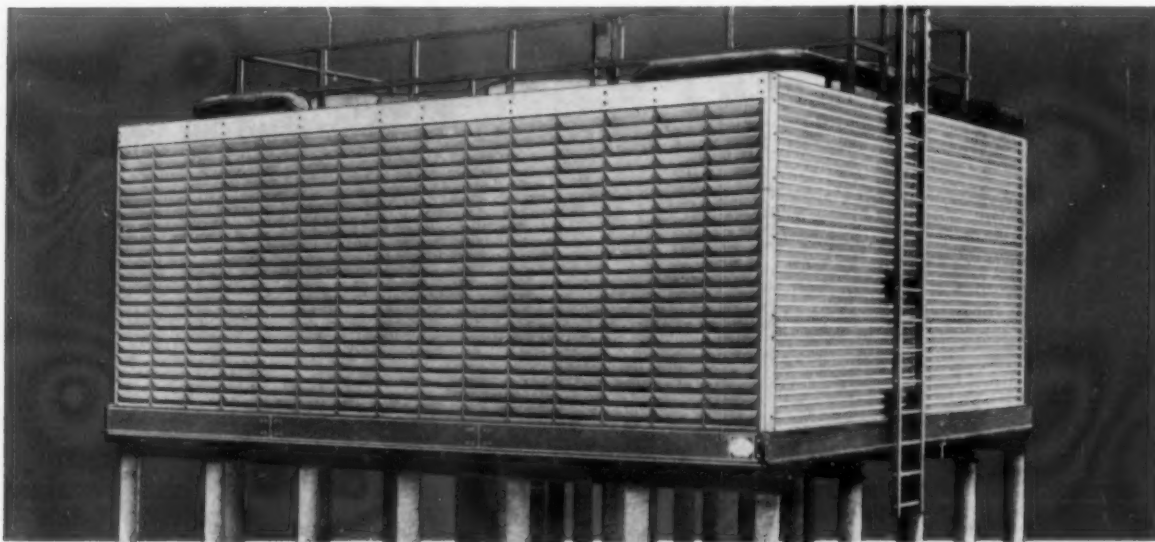
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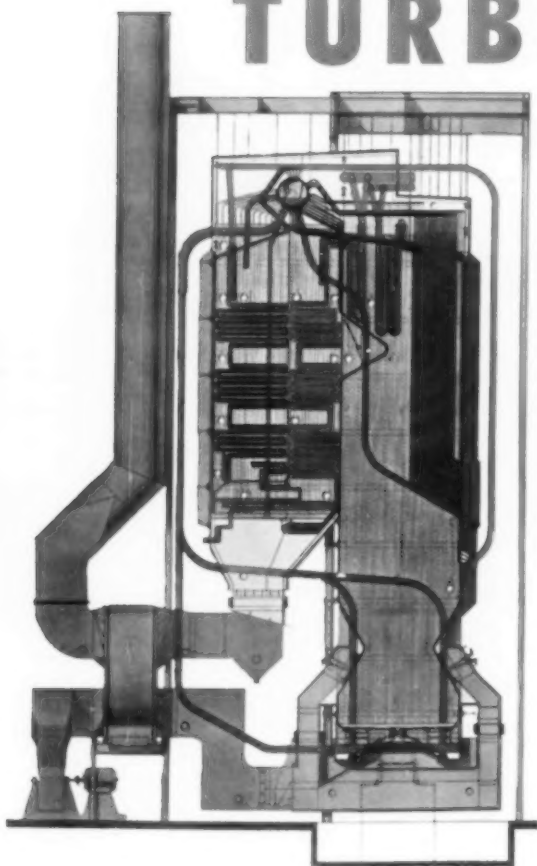
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Your Answer to Full Fuel Utilization in the '60's...

...**RILEY** Boilers With The **TURBO FURNACE**



Any fossil fuel can be fired in a Turbo Furnace singly and in any combination. Advanced operating and performance characteristics represent important strides in the art of fuel burning and steam generation. In recent years the Riley Turbo Furnace Boiler, a relatively new concept of boiler-furnace design, has been widely accepted by public utilities, manufacturing industries and their consulting engineers.

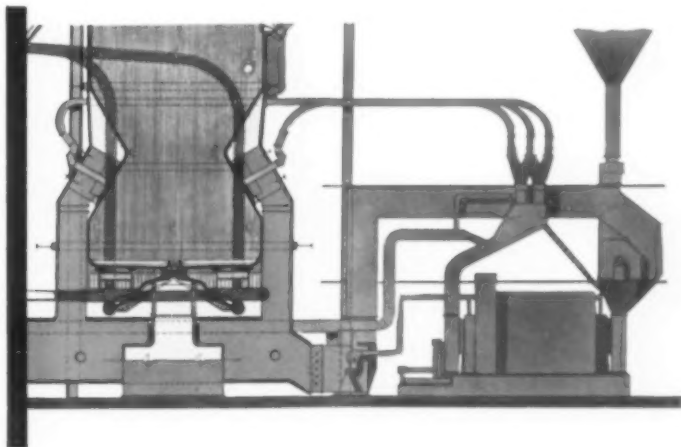
Turbo Furnace Boilers now in operation and under construction range in size from industrial type installations to high capacity central station units. Many Turbo Furnace Boilers are pressurized. Some are designed to fire coal, oil and gas separately or in any combination depending on B.T.U. cost of fuel.

Coal fired Turbo Furnace Boilers have these advantages: the elimination of the problem and cost of flyash disposal, the elimination of slag blowers, the ability to tap slag through a wide load range. Four Turbo Furnace Boilers are successfully firing fluid coke, which is handled as a pulverized fuel.

Many boilers of this design were purchased in anticipation of a changing fuel market because the design offers a simple low cost means of transition from one fuel to another.

The 1,650,000 lb/hr Turbo Furnace reheat boiler design for Louisiana Power and Light Company's new Little Gypsy Steam Electric Station . . . pioneer in complete automatic operation. Boiler operation at 2350 psig, 1005 F. superheat, reheat; pressurized.

Because the basic design of the Riley Turbo Furnace Boiler is suited to firing a wide variety of fuels, a boiler initially installed to burn oil and gas requires little alteration to equip it to burn pulverized coal. The design at right is a boiler originally installed for oil and gas. Many of the provisions for pulverized coal firing are accomplished externally while the boiler is kept in service on oil or gas.



A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.



RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

Here Are Some Desirable Characteristics You'll Find In A Riley Turbo Furnace Boiler

Simplified Steam Temperature Control

Performance varies little with type and grade of fuel being burned. Furnace exit temperature is lower than for horizontally fired boilers of equal heat release rates because heat absorbing surfaces are used more effectively. This simplifies steam temperature control.

Reduces Flyash Problems

Reinjection of flyash and continuous molten ash discharge eliminate costly flyash collection and disposal problems. Flyash combustible losses are eliminated. Some installations receive flyash from adjacent dry bottom units for disposal in the Turbo Furnace.

Reduction of Air Pollution

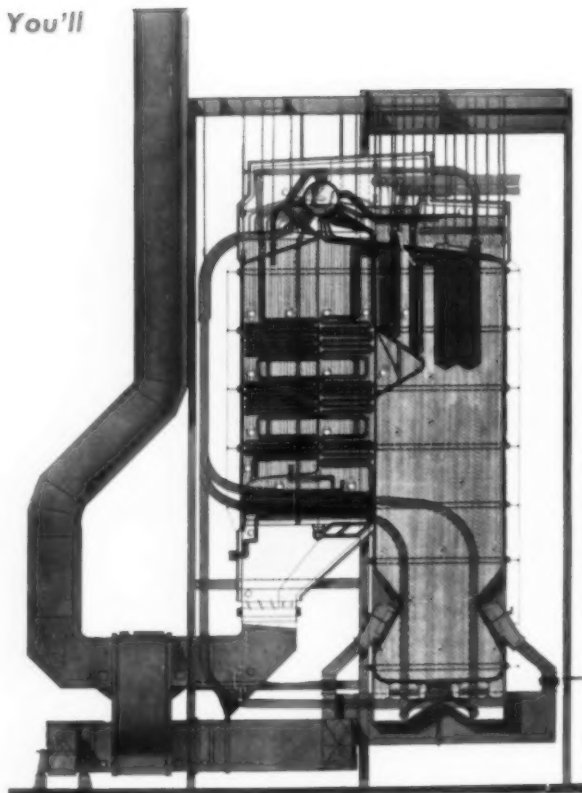
Because of the burning method, flue gases contain lower quantities of objectionable oxides of nitrogen.

Continuous Slag Tapping At Low Loads

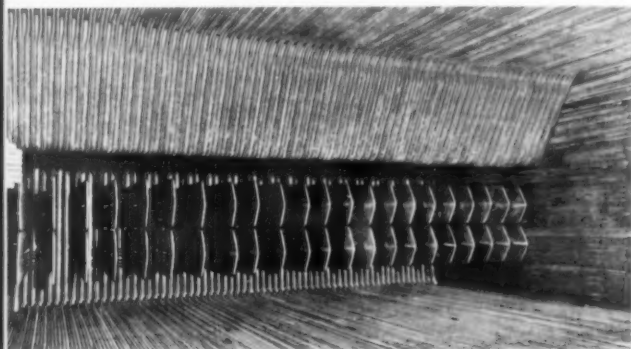
Burners are directed downward and fire on the floor around the tap hole assuring tapping at low load operation and making possible the use of higher fusion coals. Continuous flow of slag has been obtained at 25% of maximum continuous rating.

No Furnace Wall Deslaggers are Normally Required

Because of high ash retention in the bottom and the uniform vertical gas flow pattern furnace wall slagging is substantially eliminated.



The 1,550,000 lb/hr Turbo Furnace Boiler at Louisiana Power & Light Company's Sterlington (La.) Steam Electric Station, 2125 psig, 1005/1005 F pressurized. At left—View across 55 foot wide furnace at superheater elevation.



Higher Heat Releases Permitted

The fuel is burned within the Turbo Furnace bottom, just above the Turbo Furnace floor . . . the entire furnace wall area is available for heat recovery. The nominal heat release may thus be higher than for horizontally fired boilers.

Lower External Structure Cost

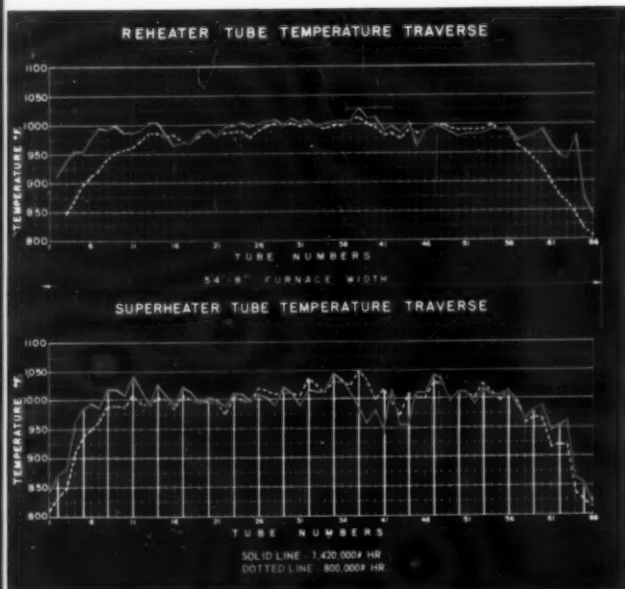
With lower furnace heat releases permitted the Riley Turbo Furnace boiler occupies less cubical space. One burner level eliminates platform and ladder construction costs.

Wider Single Furnace Boiler Units Permitted

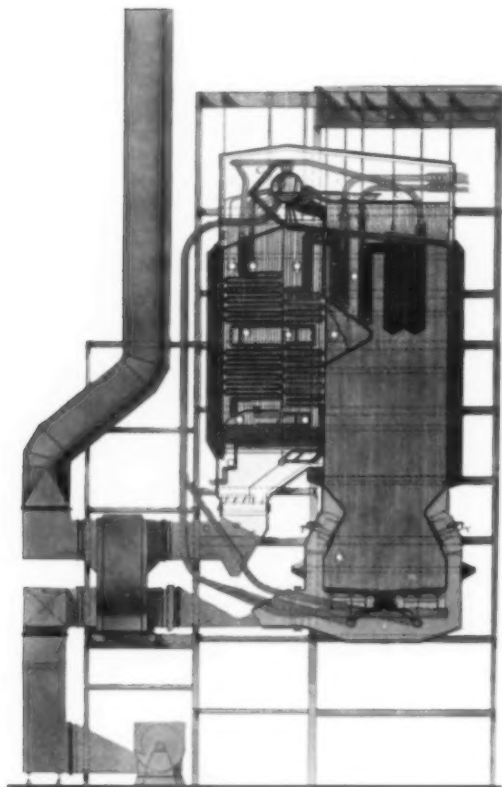
Furnace design, combined with the opposed method of firing, controls gas flow pattern to remove limitations on furnace widths inherent with other methods of firing. Gas temperature traverses at the furnace exit are extremely uniform.

Minimum Metal Temperature Variations Due To Uniform Gas Flow

The view at left and chart are of the 55 foot wide single furnace of the 1,550,000 lb/hr unit above. Furnace has no division walls or platens. The chart shows the uniform metal temperature gradient of superheater and reheater tubes spaced across the width of the furnace. The maximum variation above the normal 1005 F is well within safe limits assuring long metal life. The chart also shows the same uniform pattern for lower loads.



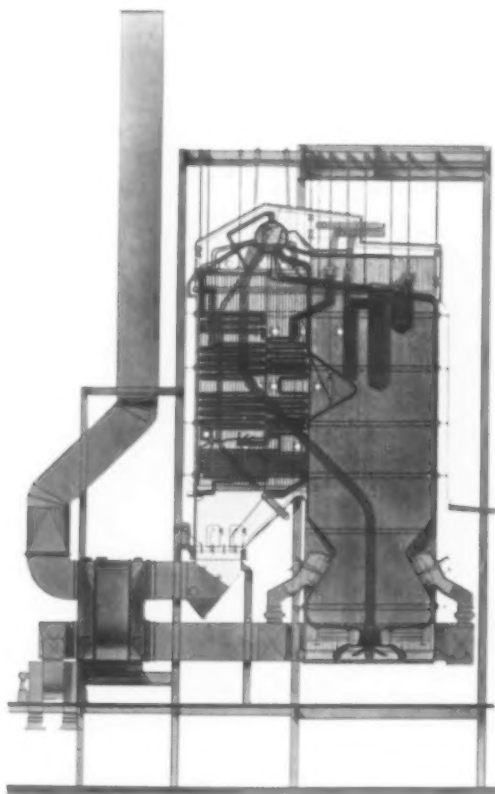
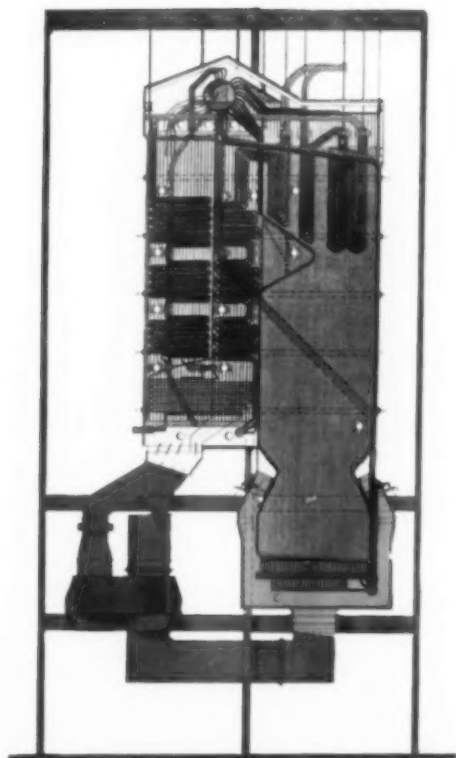
TYPICAL RILEY TURBO FURNACE BOILER INSTALLATIONS



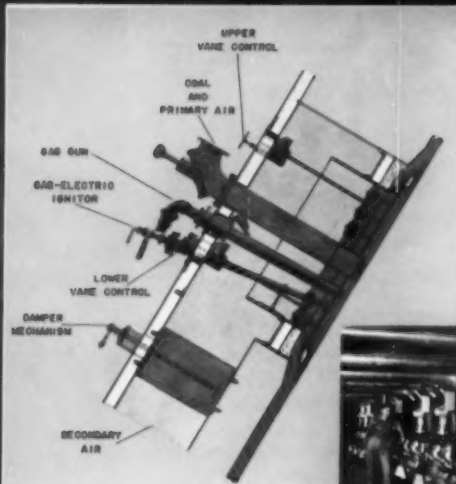
At left — North Lake Steam Electric Station, Dallas Power & Light Company. 1,200,000 lbs/hr — 2125 psig, 1005/1005 F with pressurized Turbo Furnace. Fired by natural gas and oil.

Lower left — Turner Unit No. 4, Florida Power Corporation. 600,000 lbs/hr—1650 psig, 1000/1000 F. Fired by oil and natural gas.

Below — Permian Basin Steam Electric Station, Texas Electric Service Company, 825,000 lbs/hr, 1750 psig, 1005/1005 F. pressurized. Fired by natural gas, oil, (Future pulverized coal).



RILEY
STEAM GENERATING & FUEL BURNING EQUIPMENT

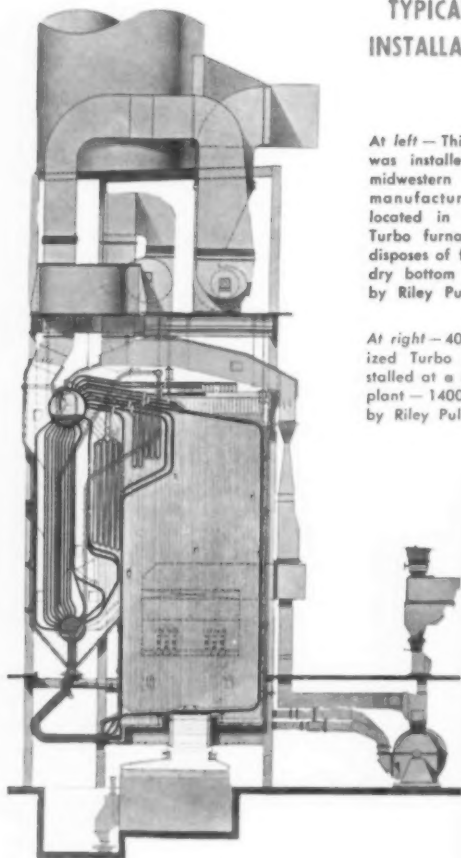


Turbo Furnace Burner Maintains Stable Flames Over Wide Load Ranges.

Riley Directional Flame Burners are designed expressly for the Turbo Furnace to burn gas and oil and pulverized fuels that are burned in suspension such as coal, lignite, fluid coke, delayed coke, etc. Burners are arranged for opposed firing on one level. Fuel and combustion air are introduced thru openings between furnace wall tubes. There is no exposed refractory to maintain. Directional vanes control placement of flame. Turn down ratio for gas is limited by gas flow control system; minimum load for oil is limited only by oil atomization (7 to 1 ratios have been attained). Stable flames with coal firing are easily maintained on a 5 to 1 load ratio.

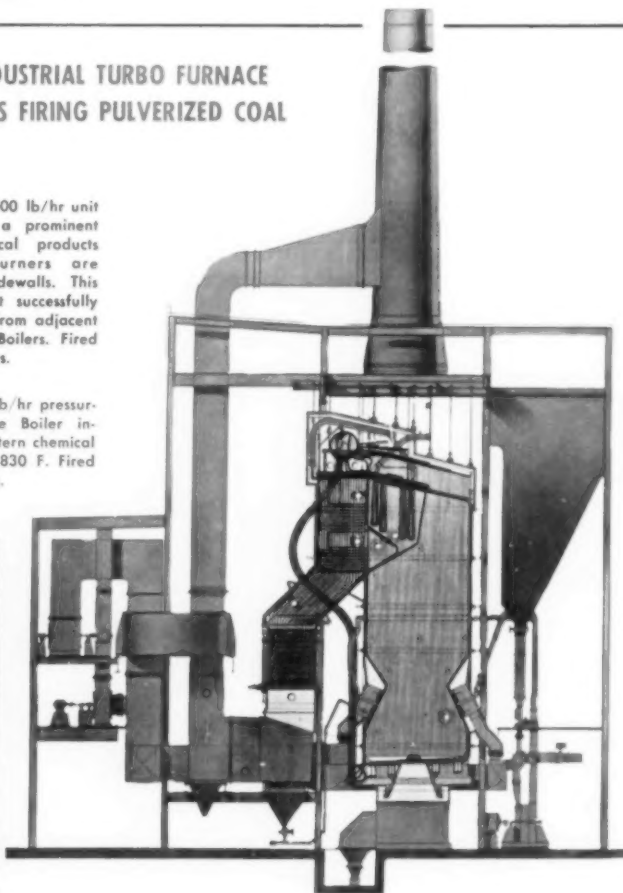


TYPICAL INDUSTRIAL TURBO FURNACE INSTALLATIONS FIRING PULVERIZED COAL



At left — This 150,000 lb/hr unit was installed by a prominent midwestern electrical products manufacturer. Burners are located in the sidewalls. This Turbo furnace Unit successfully disposes of flyash from adjacent dry bottom Riley Boilers. Fired by Riley Pulverizers.

At right — 400,000 lb/hr pressurized Turbo Furnace Boiler installed at a midwestern chemical plant — 1400 psig, 830 F. Fired by Riley Pulverizers.



Ask your Riley representative for detailed information about Riley Turbo Furnace Boilers — or write direct to RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS.

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INDUSTRY SPEAKS



Automation Calls for New Kind of Maintenance

INCREASING AUTOMATION in American factories calls for a new kind of maintenance man — a highly trained engineer-technician to cope with complex electronic control systems, a General Electric executive told the Association of Iron and Steel Engineers recently in Detroit.

Keeping production flowing is more important than ever in an automated factory, declared James J. Durkin, general manager of G. E.'s Service Shops Department, because of the capital tied up in automatic equipment and the losses that follow when a continuous process is halted by the breakdown of one component.

Mr. Durkin spoke at a meeting of the Detroit District Section of the AISE in the Ford Motor Company office building. A panel discussion on selecting and training of maintenance personnel followed his talk.

Panelists included Stanley W. Hall, Ford Steel Division; James G. Smith, Great Lakes Steel Corporation; Jack O'Neill, Algoma Steel Corporation, Sault Ste. Marie; and W. F. McMullen, Canadian General Electric Company, Peterborough. James A. Laidlaw, of Algoma, was moderator, and George Brown and Donald Corey, Detroit Edison Company, were guest panelists.

"In many plants today the maintenance man is the most highly skilled workman in the shop, the last of the craftsmen," Mr. Durkin said. "In setting maintenance standards for the ever more automatic factory, we must take this craftsmanship and pride into account and upgrade the job in training, prestige, and wage rates.

"The proportion of maintenance workers to total workers is rising and will have to increase drastically in the years ahead. The proportion of highly trained men among them will rise too.

"For computers and programming control systems there is a need for a trained engineer-technician as trouble shooter and repair man. He may merely locate a faulty sealed component, a 'black box' and replace it with a new one. But he must be well trained in the design of the control system and understand its importance and timeliness to the productive process."

Makers of automatic and computer controlled equipment now frequently supply maintenance service as part of the equipment purchase price or rental. For the average user, Mr. Durkin said, such service constitutes a large part of the cost of operating the equipment.

"I feel we will soon see the time when such service is supplied by 'pooled' technicians in key locations throughout the country, maybe on a contract basis," he said. General Electric, with its nationwide inspection, maintenance, and repair organization, is looking critically at its role in servicing customers in this area and is studying and programming the future maintenance manpower requirements by types of industry.

"We see a definite trend in more young technical men becoming interested in maintenance work and on-the-spot trouble shooting. More schools and colleges are likewise gearing their thinking and courses of study for this type of education and training."



TIMELY COMMENTS

Maintenance — — But One Thing Has Not Changed

INCREASED EMPHASIS on maintenance is evidenced on every hand: maintenance conferences, maintenance shows, maintenance magazines — and this (our own) special Annual Maintenance Issue. Even the founders' societies such as ASME and AIEE are holding meetings devoted entirely to maintenance.

There are two reasons for this increase in effort to improve maintenance procedures.

1. — Modern maintenance is more difficult, more challenging and more interesting than were repair procedures of the past.
- 2 — Maintenance is more important to production and to the financial sheet than it was only a few years ago.

Our older readers will remember the revolution in maintenance caused by electric arc welding many years ago — and they may even remember when sand blasting produced the first clean surface for maintenance painting. But by and large the maintenance man's life was more or less complacent in the "good old days." He patched, he replaced, he cleaned, he painted, and he poured in the oil. When something broke, he made a new piece or placed an order for a replacement. Few indeed were the failures that could shut down a whole plant or a major department. Plants had spare elements and excess capacity in each element. We could stand a break-down here and there.

Then came inflation with a two-pointed dagger: Equipment prices are now too high to permit many spares, and manpower is so expensive that production lines and automation are essential.

So we can't permit any more break-downs. We must have preventive maintenance. But not simple preventive maintenance. We must have preventive maintenance of automated, high-speed, single-line production units. So now maintenance approaches the same professional standing as design and production. It is a science and a challenge.

Not alone is the equipment more complicated and more difficult to maintain — but the tools and materials are more scientific and require more knowledge.

We have many kinds of electrical testers and trouble-shooting devices. We have x-ray, and sonar, and

inductive fault detectors. We have alkyds, vinyls, epoxies, silicones and polyesters — synthetic sheets and pipes and fibers. We have cathodic protection, and too many special metals to mention. *Ceramics* no longer means bricks and glass — it can mean tools and coatings and special high temperature components.

Some of these things require highly specialized skills. Water treatment alone is a science in itself — and the man that understands static controls and electronics is a lone wolf in most organizations — discussing his problems with the boss won't help him much.

Perhaps we are going too far too fast — and in many instances I think we are. But the snowball has gotten too big to push; now many have to run merely to keep up.

Yet in this hectic state of affairs we must maintain sanity. The wheels must turn and the maintenance man must see that they do.

The problem must be recognized from top to bottom in the plant organization and everyone must help: management, engineering, production, purchasing and of course the *master mechanic*. Excuse me — I mean the *maintenance engineer*.

But one thing has not changed. The job still has to be done with men, materials and effort.

So the job breaks down into: 1—organization, 2—application, and 3—procedure — just like any other job.

That's where SPI hopes to help in this special ISSUE. Rather than try to cover the waterfront (which is impossible) we present many specific articles on how to do individual jobs — mostly case studies of proven methods that have served in your neighbors' plants:

- 1 — Articles on organization, training, scheduling and inspection,
- 2 — Articles on choice of materials and equipment to solve specific problems,
- 3 — Articles on methods and procedures that have been proved effective.

Please write the editors, we value your suggestions for improvement.

—MEMO—

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Operation of power and processing plants at today's high steam temperatures and pressures requires the most efficient thermal conservation control.

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Mundet engineering and contract services are available through conveniently located branch offices and authorized distributor-applicators . . . to meet the most exacting requirements for steam-electric generating efficiency and trouble-free maintenance.



Two Mundet products widely used in power plants are Mundet "Tri-Calite" calcium silicate insulation and Mundet "Custom-Molded" 85% Magnesia.

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Left to right: plant engineer, general foreman, newly promoted group leader, and employee and public relations manager.

Alabama Plant Manager Says Handle First Promotion With Care

To Get Top Maintenance Supervisors

IF YOU WANT to get successful supervisors from your maintenance work force, be sure you handle the "first" promotion right. The first step up the promotion ladder is, in many ways, a lot more critical than stepping up to the top rungs. It marks a transition in the relationship between employee and employer, and the point at which basic managerial attitudes, duties and responsibilities should be established.

Certainly this approach has worked for us very successfully. For instance, when our Decatur, Alabama plant was opened in 1948 it was one of the first industrial organizations in an essentially agricultural area. The work force consisted mostly of people skilled in working with farm equipment, rather than industrial machinery. Today many of our supervisory and managerial people are from that original unskilled group. We feel that a major factor in maintaining a continued flow of super-

By H. J. ROSS

**Plant Manager
Wolverine Tube Division
Calumet & Hecla, Inc.
Decatur, Alabama**

visory people from within the plant is due to the "first promotion" properly handled.

There are three facets to the first promotion operation: selection, recognition and instruction. All are equally important.

Selection

If a promotion system is going to work — an equitable, simple and clearly defined set of criteria should be established for selecting candidates for promotion. Also, the whole evaluational procedure should be simple and easy to follow.

Our supervisors use a form (Rating Sheet) as the basis for recommending promotion from working job classification to Group Leader.

Each man in a group is ranked within the group.

For instance, preference is given to older men because, all other things being equal, an older man will generally be mature. In the age column, the oldest man is assigned a value of (1), next oldest (2), and in a group of five, the youngest would be rated (5).

Similar ratings for all of the criteria are totaled and the man with the lowest total is ranked highest. He is a candidate for promotion. The criteria used for evaluation are as follows:

- Age
- Education
- Mental ability test score
- Veteran status
- Length of employment
- Attendance record
- Average performance rating

The Rating Sheet

Material that is included in the Promotion Rating Sheet is obtained from the employee's personal

Newly promoted group leader (wearing cap) is shown: 1—Getting the day's working instructions from the foreman; 2—Proposing an improvement in fabricating part with foreman; 3—Filling out time report on projects completed for the day.

history envelope. The first three columns show: Name, Age and Education. The fourth column shows the score on the "Mental Ability Test." The fifth, sixth and seventh columns are headed respectively Veteran, Length of Service in the Plant and in the Department.

The eighth column is headed "Attendance," and shows the number of times: Absent With Notification, Leaves of Absence, Absent Without Permission, and Tardy.

Additional columns give the results obtained from a Performance Rating Form which is completed annually by the supervisor and filed in the employee's personal history envelope.

The extreme right-hand column is headed "Weight" and is used by the Industrial Relations Department and the Plant Operations Department. Each Department independently arrives at a rating of the man based on personal knowledge rather than statistical data contained in the promotion rating form. At the preliminary discussion between the representatives of the two departments an agreed rating of the man is arrived at, based on opinion and statistical data.

Recognition

Once the decision is made to promote the man to group leader specific recognition is made of the event. Prior to the day the promotion is to take effect, the department general foreman and plant engineer bring the man to the office of the employee and public relations manager. At this meeting the method of selection is discussed. The selected man is told he has competed against others and he is offered the promotion.

The plant engineer and general
(Continued on page 99)





Cartersville, Georgia, Plant Shows DUST SUPPRESSION CAN BE PROFITABLE

DUST CONTROL is a tough problem in any manufacturing plant using or processing bulk raw material or handling large quantities of coal for their plant power or steam. Dust can create so many problems: employee relations, public relations, maintenance or just good housekeeping.

Marquette Cement Company's Cartersville, Georgia, limestone quarrying and crushing operation has found that dust control can offer some actual monetary rewards in addition to the intangibles such as employee relations and public relations. In Marquette's operation, dust control: (1) increases production, (2) stops equipment overloading and jamming, (3) cuts cleanup time, (4) reduces maintenance and (5) practically eliminates material loss.

In searching for an effective method to control dust at this quarrying and crushing operation, the company surveyed the operation to determine both cause and effect of any dust generation. Production was suffering, dust from the secondary crusher and vibrator screens would obscure the primary crusher operator's view of the conveyors and screens. Whenever this happened, he was forced

to cut back on the feed rate to avoid overloading and jamming the screens and possibly tearing a belt.

Abrasive dust, settling on equipment, added time to cleanup operations and increased wear on bearings, sprockets, chain drives and other equipment. Dust blowing off of bottom-dump rock trailers used to transport the crushed limestone to the plant was also a possible source of public annoyance.

How It Was Cured

Dust control engineers from The Johnson-March Corp. reviewed the operation and recommended a series of sprays to apply a chemical solution at the major dust producing points.

The chemical solution is a mixture of water with a minute portion of a surface-active compound, called Compound MR—actually, one part of compound to 750 parts of water. This small amount of compound breaks down the surface tension of the water causing it to spread further, penetrate deeper and diffuse more widely than untreated water.

Wetting with plain water is none too effective. Small particles of dry dust sit on the surface of

the water. Untreated water sprayed on a pile of dust forms globules and rolls off, leaving the dust free to rise into the atmosphere.

Very little moisture is needed when such a wetting solution is used. As little as one-half of one per cent moisture, added in the proper manner, is sufficient to keep fines from rising into the atmosphere. Spray jets are located wherever dry material changes its direction of travel or is subjected to disturbing air currents.

At Cartersville, the solution is mixed, automatically, in a small pump house. Flow of water into a mixing tank is held constant and a special liquid flow proportioner controls the amount of compound added. The proportioner is equipped with a positive displacement pump utilizing a spring bellows that will meter liquids at desired volumes with an accuracy of one per cent. Pumping action is achieved by flexing the bellows with a cam on the output shaft of the drive motor.

Two applications of the solution are made in the primary crusher. The rock is hauled about one quarter mile from the rock face in 15-ton back dump trucks. Trucks dump their loads into a feeder



The view on opposite page shows the plant operating without the dust suppression system. Above—the suppression system is turned on and the same plant operations are taking place.

that discharges into a primary jaw crusher. First application of dust control solution is into the crusher jaws. The crusher operator selects these sprays by push button control interlocked with the feeder drive. When the feeder stops, the sprays stop automatically.

Spray jets at the discharge of the primary crusher, and throughout the rest of the operation, are actuated by automatic controls lo-

cated beneath the conveyors. These controls turn on the sprays.

The most critical applications are at the mouth and discharge of the secondary crusher. It is dust from these points that obscures the operator's view of the screens and return conveyors making it necessary to cut back on the feed rate.

During particularly dry spells, another set of sprays is used at the

transfer of the 24" reclaim conveyor. Generally, spray from the crushers has sufficient carry-over effect to make the last application unnecessary.

In addition to increasing production, reducing material loss and improving employee morale, clean-up time is cut. Less dust, less cleanup. The same is true of maintenance. Abrasive dust particles cause excess wear on bearings, sprockets, chain drives, electric motors, etc.

The cost of applying Compound MR solution varies from $\frac{1}{4}$ - to $\frac{1}{2}$ -cent per ton of processed material.

This before and after illustration shows effects of the dust suppression system.



The Productive Electrical Maintenance Program

By W. BARBAROWICZ

Supervisor of Inspection Engineering
International Minerals & Chemical Corp.
Bartow, Florida



ARE YOU denying yourself the benefits of a productive maintenance program? You needn't. This article describes a program that can be put into immediate use. Although specifically prepared as a program for a large electrical department, it can be adapted for any maintenance function in any plant.

We are all interested in effective maintenance. Maintenance should be considered *productive*, not *preventive*, to give it the dynamic recognition it deserves. Maintenance is like a production line. If maintenance gets 1) better tools, 2) adequate organization, 3) systematic procedures, and 4) engineering help — maintenance will give "increased production."

No one program is a cure-all for all maintenance problems. The best maintained equipment will break down, but a systematic productive maintenance program will reduce equipment breakdowns. This reduction will result in lower costs and increased production.

Functions of Program

The normal functions of most electrical maintenance departments are to:

- A. Maintain equipment records.
- B. Inspect equipment.
- C. Routine tasks.
- D. Follow a schedule to maintain equipment at the lowest cost with a minimum interruption to production.
- E. Maintain work order system.
- F. Perform emergency work as required.

The operating procedures out-

lined hereafter cover all the above work.

Purpose of Program

The purpose of a maintenance department is to prevent interruptions to the production processes. This can be best achieved by a productive maintenance program. The program will permit management, not the equipment, to decide when repairs are to be made.

It is the aim of this program to schedule 90 per cent of the work being performed. This will result in efficient utilization of manpower and equipment. It will lead to lower costs and increased production.

Records and Files

The foundation of any maintenance program lies in adequate equipment records. You cannot adopt a scheduled program until you know what requires maintenance.

The form of the equipment record varies with different plants and individuals. The form should have the following:

- a. The equipment number.
- b. Complete nameplate data.
- c. Date of purchase and purchase order number.
- d. Spare parts data, and reference

MR. BARBAROWICZ received a B.S. degree in Electrical Engineering from the University of Pittsburgh in 1940. Prior to World War II, he worked for the Pennsylvania Electric Company.

He was commissioned and served four years in the army, most of which time he was overseas — teaching, organizing, and administering courses in radar.

Then he served as Electrical Engineer with the Olokele Sugar Company, where he was responsible for electrical design, construction and maintenance. In 1950 he accepted a similar position with the International Minerals & Chemical Corporation in Florida. Currently, he is the Supervisor of Inspection Engineering for both mining and chemical plant operations at IMC.

drawing and instruction book numbers.

- e. Location of installation.
- f. Subsequent location changes.
- g. Complete case history.

The case history is particularly important. It should be diligently maintained and should include information on the following: 1 — Breakdowns, 2 — Repairs and overhauls, 3 — Replacement of parts, 4 — Major periodic inspections.

Part 1 in this issue -- Functions, Purpose, Description
Part 2 to follow -- Planning and Scheduling Work

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Repair Day Inspection & Preventive Maintenance
Check List for G. E. FK-142 Oil Circuit Breaker
Refer: GEI-7019J, GEI-11306E, GEI-12010G, & GEI-16390C

Car No. _____ FK-142 OCB No. _____

Location _____

Listed below is a check-off Inspection & Preventive Maintenance list for the FK-142 Oil Circuit Breakers. The check list is self-explanatory.

The remedy listed is intended to note exactly what is done to the various parts of the breaker.

Be sure that all electrical connections are tight and, also, all bolts, nuts, pins, etc.

There is a space reserved at the end of this list for Remarks. This is intended to get your ideas on what should be done to the breaker which is not listed, or any other ideas you may have.

I. Closing

<p>A. Relays (X & Y)</p> <p>1. Electrical Connections</p> <p> a. tight _____</p> <p> b. loose _____</p> <p> c. other _____</p> <p> d. Remedy _____</p> <p>2. Shunts</p> <p> a. Flexibility O.K. _____</p> <p> b. brittle _____</p> <p> c. stiff _____</p>	<p>3. Contacts</p> <p> a. clean _____</p> <p> b. dirty _____</p> <p> c. need changing _____</p> <p> d. other _____</p> <p> e. Remedy _____</p> <p>4. Operation</p> <p> a. free _____</p>
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Exhibit B — Routine check list.

plant down time. Repair days are normally crowded days and should not be extended for routine inspections.

Periodic Inspections

Periodic inspections are detailed inspections which require dismantling of equipment. They may require critical time consuming tests and adjustments to equipment. These inspections should be made from detailed check lists.

The electrician should complete the form and turn it in to the electrical maintenance superintendent. The superintendent will indicate to the clerk which items, if any, should be entered into the case history of the equipment record card. The work performed during periodic inspections should be recorded under the case history.

A tabulation should be made of all equipment requiring periodic inspections showing frequency of inspection. A schedule and calendar reminder can then be established. The schedule should distribute these inspections throughout the year.

Routine Work

The electricians do certain routine jobs such as cleaning, lamp

replacement, periodic meter reading, load checks, routine check of operations, some lubrication, complete time sheets, and similar chores.

This type of work should be assigned on a routine basis. It should not be necessary to schedule this work daily. Time for such duties must be allowed in the productive maintenance schedule.

Scheduled Work

As mentioned earlier in the report, the aim should be to schedule 90 per cent of the work being performed by the department. The following types of work should be scheduled on a work order system.

Periodic Overhaul

This work will be done on a work order system. The overhaul is planned six months to a year in advance and based on periodic inspection reports, experience, and case histories. The ultimate aim is to thoroughly overhaul every piece of equipment before it breaks down.

Assigned Work

This work covers repairs, replacements, relocations, minor changes, pit moves, accompanying equip-

ment in transit, etc. It should be done on a work order system. The work should be planned and scheduled several days in advance; it is assigned on a priority system.

Capital Improvements

This work should be done on a work order system. It should be fitted into the maintenance schedule. The engineer or operating department responsible for the work should outline the work as early as possible. If the work schedule is overloaded, this work should be contracted to outside companies if possible. Otherwise temporary or extraordinary crews may have to be recruited.

The remaining section of this article (Part 2) will appear in an early issue. Planning and scheduling will be covered.

Automatic Roof Cooling

OUR ORIGINAL April Showers installation was made when the first building was erected in 1949. Since then, we have added two more buildings, so that we now have about 60,000 sq ft of roof surface cooled by April Showers automatic roof cooling systems. These spray systems have enabled us to air condition our plant with units smaller than would be required if we did not have automatic roof cooling systems.

Maintenance on these systems consists mainly of the winter shut-down when the end caps of the feeder lines are removed and the system is drained, and then, of course, the replacing of the end caps and putting the system in operation the following spring. Also, about twice during the summer, the spray head caps are loosened to flush out the heads. This can easily be done by one man in less than a day's time. A few drops of oil discreetly placed on the lever fulcrums of the operating valves reduces trouble at this point.

By **JAMUS DeHAMER**,
Chief Engineer
Columbia Products Company
Columbia, South Carolina

Effective Scheduling of Shutdown Repairs

THE MANNER in which the maintenance control department handles the scheduling of shutdown repairs can well mean the difference in hundreds of tons of production and thousands of dollars in labor and material expenditures each year for a continuous process industry.

For example, a pulp or paper mill must operate on a continuous basis for economy. But it doesn't require the wisdom of a Solomon for the average person to realize that a rotating mass of iron and steel, operating twenty-four hours per day seven days per week, month in and month out, will demand adjustments, repairs and overhauls.

The quality and quantity of the product output and the manufacturing cost per unit of production depends greatly on the efficiency of the maintenance programming and the ability of the maintenance crews to carry out these plans in the field. Therefore the scheduling of shutdown repairs is of prime importance to any maintenance control program.

Before going further, may I acquaint you with the meaning of the word "shutdown" to the writer, in association with the maintenance of a pulp and paper mill. "Shutdown" to the writer means that equipment is down and production is affected. Whether this equipment is one unit, a machine, a department, or the entire mill, is secondary insofar as defining the word "shutdown" is concerned. These factors only serve to determine the magnitude of the situation.

The urgency lies in the fact that equipment is down, repairs must be made, and the equipment put back into production as soon as possible. There are only two types of shutdowns:

1. The emergency breakdown
2. The planned shutdown

Emergency Breakdown

The emergency breakdown not only means a loss to production,

but that repairs will be made on an unplanned basis. Unplanned means disorganized, and an emergency breakdown on a disorganized basis means a longer delay and greater cost than is necessary.

If the maintenance control department is functioning as it should with complete cooperation from the operating superintendents, an emergency breakdown can usually be turned into a planned shutdown in less than thirty minutes.



By **BERT CARSON**

**Maintenance Planner
Hudson Pulp & Paper Corporation
Palatka, Florida**

The following course of action is very effective:

1. Determine the nature of the breakdown.
2. Dispatch only the manpower necessary to make the repairs, no on-lookers.
3. Determine other equipment, departments, and sections of departments affected.
4. Have the maintenance scheduler pull all shutdown jobs from the schedule board for areas affected.
5. Sort these jobs by area and maintenance trade.
6. While items 4 and 5 are being done, secure a reliable estimate

of the length of time required to effect the emergency repairs.

7. Pull those shutdown jobs by trade and area which conform to the estimated emergency down time.

8. Total the manpower required.

9. Pull the necessary manpower from routine scheduled work.

10. Dispatch this manpower to these jobs.

After the repairs have been made, all manpower should be instructed to return to the regular scheduled work. By taking advantage of emergency breakdowns in the prescribed manner, many necessary shutdowns can be avoided.

Planned Shutdown

A shutdown can be planned for two hours or several days, depending on the work load, the size of the maintenance crew available, and the nature of the work. There are times in nearly all types of industry when it is necessary for operation to shut down equipment for short durations to replace worn parts. For example, in the paper industry we must occasionally replace:

1. Fourdrinier wires
2. Washer wires
3. Machine clothing, etc.

These shutdowns can be determined in advance. The maintenance department should take every advantage of this operational down time to effect other repairs. If the work is carefully planned, big jobs may be done during this time, such as the replacement of large pipe lines, the changing of motors, gear reducers, etc.

The secret lies in being prepared. Take for instance, the replacement of an eight inch all welded pipe line:

1. Secure all measurements while the machine is running.
2. Lay out, fabricate, and test the replacement section.
3. Hoist the replacement section into position and tie it off.
4. Erect the necessary scaffolds, and move the equipment, such as

welding machines, cutting torches, etc., into position.

5. Schedule a pipefitter and welder for each tie-in prior to the scheduled "wire change."

6. Have the crews standing by when the machine goes down.

7. Cut the old section out.

8. Swing the new section in, and

9. Make the two welds.

The above is a very simple example. The extended shutdown, whether for one machine, a department, or the entire plant, entails more complications and calls for more intricate plans.

The entire plant should never go down for an extended shutdown so long as there is a backlog of orders. Some production can be maintained in most plants at all times, unless a power failure occurs.

An extended shutdown in any mill should be avoided for the following reasons:

1. There is a complete loss of production.

2. The normal maintenance crew cannot possibly cover the situation effectively, therefore

3. If all the work requested is to be performed by the regular maintenance crew, the down time and expense involved will be economically prohibitive.

The down time required on any shutdown is in direct proportion to the man-hours of work to be performed, as opposed to man-hours available for scheduling.

Work requiring that the entire mill be down, such as repairs to certain steam headers, power lines, etc., should be given top priority for shut down during holidays. In scheduling work for such occasions as July 5th, the day after Labor Day, etc., these jobs should be manned first. The remaining crew should be scheduled on shutdown work in the following order, where:

1. One or more departments are affected.

2. A machine is affected.

3. A unit of equipment is affected.

The real savings in the planning of shutdown work is in obtaining maximum production month in and month out. The extended shutdown is a tool to be used in accomplishing this end, not on a mill-wide basis, but on a depart-

To: ALL DEPARTMENT SUPERINTENDENTS

Subject: BLEACH PLANT SHUTDOWN

The Bleach Plant will be down from 8:00 A.M., May 5, until 8:00 A.M., May 14, due to a special run of unbleached stock.

This department will be available to Maintenance to effect shutdown repairs during this period.

Maintenance work will begin as shown in this schedule at 8:00 A.M., May 5, and be completed by 4:30 P.M., May 13.

The following manpower will be necessary to effect these repairs.

TRADE	MON. 5	TUE. 6	WED. 7	THU. 8	FRI. 9	MON. 12	TUE. 13
Millwrights	2	2	2	2	1	1	1
Welders	0	1	2	2	2	2	2
Pipefitters	1	1	1	1	1	1	1
Instrument	1	1	1	1	1	1	1
Carpenters	1	1	1	1	1	1	1
Yard Crew	3	3	3	3	3	3	3

NO OVERTIME WILL BE WORKED ON THIS SHUTDOWN WITHOUT THE AUTHORIZATION OF THE MAINTENANCE SUPERINTENDENT. Regular off days (Sat. & Sun.) will be observed.

Bert Carson

Bert Carson, Maintenance Planner

Cover sheet for detailed shutdown maintenance plan.

mental or machine basis, depending on their functions in view of the overall production picture. The thinking behind this statement being that a plant has a maintenance crew for the purpose of maintaining the plant, not to build it.

This crew, if efficiently controlled, could conceivably rebuild the plant over a period of time, if it became necessary. In order to do this, and at the same time maintain a reasonable degree of production, a well organized, long range planning program will be necessary.

This type planning is not for an amateur. It demands the services of an expert who has complete cooperation from the entire management team. Once the preparatory plans have been formulated and approved, the planning crew should concentrate on one section of the plant at the time, preferably that section which is amassing the highest delay due to emergency

breakdowns.

All parts and supplies should be expedited. Fabrications should be completed and delivered to, or in close proximity to, their intended location. Scaffolds should be erected and fire extinguishers placed in strategic locations.

Estimating and Planning

Each job should be estimated for actual shutdown time. The planning crew should lay out the shutdown. A meeting of all management personnel affected should be called. The maintenance controller should go over the entire shutdown in detail at this meeting, covering such items as:

1. The length of major jobs.
2. The starting and completing time of each job.
3. The date the shutdown will begin.
4. The approximate date and time when the work will be completed and the department turned

TRADE <u>Millwrights</u>					WRIGHT THOMPSON										TOT. HRS.
COST ENTER	EQPT CODE	EQPT NO.	ORDER NO.	CLASS	DESCRIPTION OF WORK	ASSIST TRADES	CHRY NO.	M	TU	WED	THU	FRI	SAT	SUN	
09	PLA	016	7029	98	Repair Duro Acid pump at acid tank. Install Mechanical Seal.	5	A	←							8
09	MLX	006	7025	98	Add a ring of packing to radial flow mixer.		A		→						4
09	FRN	002	7024	98	Re-pack air pressure feeder.		A		→						4
09	WSH	001	7020	98	Renew necessary bands on bleach washer 001. Repair or renew facing wire as necessary.	2	A		→						8
09	WSH	002	7021	98	Renew necessary bands on bleach washer 002. Repair or renew facing wire as necessary.	2	A		→						4
09	WSH	003	7022	98	Renew necessary bands on bleach washer 003. Repair or renew facing wire as necessary.	2	A		→						4
09	WSH	004	7023	98	Renew necessary bands on bleach washer 004. Repair or renew facing wire as necessary.	2	A		→						4
09	TAC		7015	98	Install a hoist for raising the explosion seals on top of #1 and #2 Class reactor, safety device when power goes off.	2,6	A						→		16
09	MOB	121	7003	98	Free up anchor & adjusting bolts on motor, MOB 121 to caustic steam mixer. For tightening "V" belts.		B	→							4
09	MOB	122	7004	98	Free up anchor & adjusting bolts on motor, MOB 122 to caustic steam mixer. For tightening "V" belts.		B	→							4
09	MOB	123	7005	98	Free up anchor & adjusting bolts on motor, MOB 123 to hypo steam mixer. For tightening "V" belts.		B	→							4
09	MOB	124	7006	98	Free up anchor & adjusting bolts on motor, MOB 124 to hypo steam mixer. For tightening "V" belts.		B	→							4

One of the detail sheets showing assignment of men for carrying out jobs during the shutdown.

back over to operation for start-up.

Once these plans have been approved by management, it will be necessary for the maintenance supervisors of the respective trades to hold shutdown meetings for their crews, covering

1. The scope and aim of the overall shutdown.

2. The jobs pertaining to their particular craft.

3. The safety measures to be taken in performing a safe shutdown.

The maintenance controller who supervised the planning of the shutdown should be present at each of these meetings for the purpose of answering any questions pertaining to the coordination of various crafts on individual jobs.

The cover sheet, which accompanies the written shutdown plan, should clearly state the number of men required by crafts to perform the shutdown maintenance work. If the down time, from the beginning of the shutdown until its completion, is less than one twenty-four hour day, the number of men required by each craft should be shown for each hour. If the length of the shutdown is longer, the cover sheet should depict the

required manpower by shifts or days.

Once the shutdown is in progress, the plan should not be varied without the knowledge of the management personnel affected, both operational and maintenance.

Changes in Plans

When a cause for varying the shutdown schedule occurs, in almost every case it erupts from additional work which was not anticipated. Usually this work is of an extremely high priority nature and the situation demands that repairs be made before the equipment can be made operative. However, regardless of how demanding the situation is, there are proper channels to go through before the shutdown schedule should be changed, and these channels should be exercised, i.e.

1. The maintenance superintendent and the operating superintendent should first determine if the additional work is of a shutdown nature.

2. The maintenance superintendent should determine the crafts involved and the time required to effect the repairs.

If it is a job of comparatively short duration, there is a good

chance that a scheduled job with the necessary tradesmen will be far enough ahead of schedule to sandwich this additional work in without affecting the overall shutdown.

If the work is of such a nature that major repairs or alterations are necessary, a meeting should be called with the manager of operations, the operating superintendent, the maintenance controller, the maintenance superintendent, and the maintenance foremen of the crafts involved.

1. The nature of the work should be stated.

2. The time required to effect the repairs should be determined.

One of two possible choices must be settled on in this meeting, i.e., whether to:

1. Delay the start-up of the machine until the repairs can be made.

2. Remove comparable man-hours from the shutdown schedule.

Should the first course be elected, the meeting will have served its purpose. Should the second course be elected, the manager of operations, the department superintendent, and the maintenance

(Continued on Page 100)

Cooling Tower Service Check-Chart

THIS CHECK-CHART is designed to assist industrial cooling tower operators in analyzing a major part of service difficulties that may arise. It was compiled by John E. King, P. E., who is in charge of the Service Engineering section of the Marley Company (one of the country's leading cooling tower manufacturers) and reflects his observations of service problems in hundreds of industrial plants. A detailed program of preventive maintenance for towers by Mr. King will appear in a later issue.



The heart and lungs of your cooling tower — motor, speed reducer and fan.

TROUBLE	CAUSE	REMEDY
Geareducer Noise	Sludged lubricant	Drain and flush with light flushing oil. Select flushing oil from lubricant supplier's recommended flushing oil compatible with lubricant used. Do not operate under load. Drain and clean interior parts. Refill with oil. See Geareducer service manual.
	Geareducer bearings	If new, see if noise disappears after one week of operation. Drain, flush, and refill Geareducer. See Geareducer service manual. If still noisy, replace.
	Gears	Correct tooth engagement. Replace badly worn gears. Replace gears with imperfect tooth spacing or form.
Unusual Fan Drive Vibration	Loose bolts and cap screws	Tighten all bolts and cap screws on all mechanical equipment and supports.
	Unbalanced drive shaft or worn couplings	Make sure motor and Geareducer shafts are in proper alignment and "match marks" properly matched. Repair or replace worn couplings. Rebalance drive shaft by adding or removing weights from balancing cap screws. See drive shaft service manual.
	Fan	Be sure blades are properly positioned in correct sockets. (See match numbers.) Make certain all blades are as far from center of fan as safety devices permit. All blades must be pitched the same. See Fan service manual. Clean off deposit build-up on blades.
	Worn gear reduction unit bearings	Check fan and pinion shaft endplay.
	Unbalanced motor	Disconnect load and operate motor. If motor still vibrates, rebalance rotor.
	Bent shaft	Make sure fan and pinion shafts are straight and properly aligned
Fan Noise	Loose fan hub cover	Tighten hub cover fasteners.
	Loose boards on inside of fan cylinder	Check and tighten if necessary.
	Loose bolts in blade clamps	Check and tighten if necessary.

TROUBLE	CAUSE	REMEDY
Motor Will Not Start	Power not available at motor terminals	1. Check all connections and contacts between the control apparatus and the motor. 2. Make sure overload and short circuit devices are in proper condition.
	Wrong connections	Check motor and control connections against wiring diagrams.
	Low voltage	Check nameplate voltage against power supply. Check voltage at motor terminals.
	Open circuit in motor winding	Check stator windings for open circuits.
	Motor or fan drive stuck	Disconnect motor from load and try to start it.
	Rotor defective	Look for broken bars or rings.
Unusual Motor Noise	Motor running single phase	Stop motor and attempt to start it. Motor will not start if single phased. Check wiring, controls, and motor.
	Motor leads connected incorrectly	Check motor connections against wiring diagram on motor.
	Ball bearings	Check lubrication. Replace bad bearings.
	Electrical unbalance	Check voltages and currents of all three lines. Correct if required.
	Air gap not uniform	Check and correct bracket fits or bearing.
	Rotor unbalance	Rebalance.
Motor Runs Hot	Motor overload, wrong voltage or unbalanced voltage	Check voltage and current of all three lines against nameplate values.
	Wrong power frequency	Check nameplate against power supply. Check rpm of motor.
	Bearings overgreased	Remove grease reliefs. Run motor up to speed to purge excessive grease.
	Rotor rubs stator bore	If not poor machining, replace worn bearings.
	Wrong lubricant in bearings	Change to proper lubricant. See motor manufacturer's instructions.
	One phase open	Stop motor and attempt to start it. Motor will not start if single phased. Check wiring controls and motor.
	Poor ventilation	Clean motor and check ventilation openings. Allow ample ventilation around motor.
	Winding fault	Check with ohmmeter.
	Bent motor shaft	Straighten or replace shaft.
	Insufficient grease	Remove plugs and regrease bearings.
	Deterioration of or foreign material in grease	Flush bearings and relubricate.
	Bearings damaged	Replace bearings.
Motor Does Not Come Up To Speed	Voltage too low at motor terminals because of line drop	Use higher voltage on transformer terminals or reduce load.
	Broken rotor bars	Look for cracks near the rings. A new rotor may be required.
Wrong Rotation (Motor)	Wrong sequence of phases	Change any two of the three motor leads.

LUBRICATION STANDARDIZATION

A Ten Point Program that Works

By **H. B. SHORTLEY, Plant Engineer**
Western Electric Company, Inc.
Baltimore Works

After his graduation from the U. S. Coast Guard Officers School in 1942, Mr. Shortley continued throughout World War II as engineering officer aboard various types of vessels until 1945 when he returned to civilian life. He started with Western Electric Company's Baltimore Works early in 1955 as an engineer in the Plant Engineering Organization.



BILLIONS of dollars were spent during World War II and the post-war period in the construction of new industrial facilities throughout this nation. It was but a few years after the surge of this industrial development that costs for new plants were being evaluated and great significance placed upon maintenance engineering by industrial management.

It was realized that in order to maintain productive efficiency and to meet increased industrial development in the years to come,

it was necessary for every manager to take a second look at his operating expense dollar. It can be said that many millions of dollars were being spent unnecessarily at that time due to an ineffective maintenance engineering program — and in a good many cases the same is true today.

When we speak of maintenance engineering it is necessary that we look at all operating phases of the business. We must look at the building structure and the associated mechanically operated equip-

ment. We must look at the manufacturing machinery installations and the many components that are a part of these facilities, including that equipment necessary for providing plant services. In general, it is necessary that we consider the plant operation as a whole.

To consider a maintenance engineering program along one line and to neglect another, would leave the overall job poorly done. It is with this theme in mind that we present a ten-point industrial lubrication standardization program

Telephone cable manufacturing operation at the Baltimore Works of Western Electric.



Air View of
Western Electric
Baltimore Plant



which involves all of the phases of the business that we have referred to above, with emphasis upon return on the investment dollar.

You are undoubtedly familiar with the many programs that have been presented by the refining industry. To go into each one of these programs would be repeating what you have already seen and heard. It is our desire to present a program for industry that can be initiated today, remain fresh in our minds tomorrow and continue to produce dividends for the future.

The plan to be presented has been prepared so that any one industry could very effectively establish a productive program. We particularly stress the importance of following each step until the results of each objective are established.

STEP 1—PREPARE AN OVERALL SUMMARY OF LUBRICANTS WHICH ARE PRESENTLY USED AND IN STOCK IN THE PLANT

A complete investigation should be conducted of all lubricants which are in use, including their specifications. This information would then be summarized by type of lubricant, such as oils, greases and any special lubricant products.

STEP 2—EVALUATE THE OVERALL COST OF THE PRESENT LUBRICATION SYSTEM

In the evaluation of the present lubrication system, in addition to lubricant cost, it is important to remember that storage facilities, methods of lubrication, and the frequency of lubrication must be considered in the cost of the present lubrication system.

Upon completion of Steps 1 and

2 an overall picture of the lubrication situation will be obtained at the plant location. This is basic data and the analysis of this information should be thorough.

STEP 3—PRESENTATION OF A PROPOSED PROGRAM

It will be fairly obvious upon review of the present lubrication procedures in the plant that certain economies can be realized by establishing a revised lubrication system. The justification for presentation of a proposed program will be based upon a return on investment.

Speaking generally, a brief look at present lubrication lists will indicate that probably 30 to 100 oils and greases are in stock. Certainly with an investment of this magnitude, savings can be realized in reduced inventory alone.

The establishment of a program cannot be undertaken by one man alone. It must be a concerted team effort on the part of all responsible for lubrication standards in the plant. Maintenance routines must be reviewed and personnel qualifications analyzed. Machinery specifications must be scrutinized for proper lubricant application.

Misuse of lubricants must be corrected.

All of these preliminary investigations are time consuming, but are absolutely necessary to formulate a sound and constructive program.

This information, well supported with facts, will result in a well prepared presentation to Management. We are now ready to outline a program.

STEP 4—THE PROGRAM

The program should take form along the following lines:

1. Initiate a report outlining the inefficiencies and uneconomical procedures of the present lubrication system.
2. Solicit outside assistance from the refining companies to survey the plant lubrication procedures. The refining companies have certainly put their best foot forward to aid and assist industry in a better understanding of lubrication procedures and routines.
3. Present to Management an overall report outlining the present and proposed programs.

(Continued on Page 38)



Plastic insulating area for telephone cable.

4. Initiate proposed program and make it effective.

STEP 5—FIX RESPONSIBILITY FOR LUBRICATION PROCEDURES

Upon approval to initiate a new program it is necessary to fix the responsibility for proper control. Regardless of how well procedures are outlined and presented, results will depend largely on its control.

Each member of the lubrication study team must be vitally interested in his phase of the responsibility. The responsibility can be distributed as follows:

1. **Lubrication Engineer**—Maintains control for all new lubrication requirements. Coordinates with design engineers in the issuance of lubrication specifications or special design requiring rigid control.

2. **Maintenance Engineer**—Maintains control for all lubrication procedures, keeping abreast of all new or novel developments in proper lubrication techniques.
3. **Maintenance Supervisor**—Trains and supervises lubrication personnel to effectively maintain equipment in accordance with procedures and techniques established by the Lubrication and Maintenance Engineers.

STEP 6—CONTROL OF COSTS

It is certain that the Lubrication and Maintenance Engineers will be called upon to present cost studies of the program. Consideration should be given to maintenance of the following records:

1. Card index for cost of all lubricants and ordering frequency.
2. Card index on lubrication procedure handbook for each piece of equipment with accurate data of lubrication history.

This information will bring to light any ineffective phase of the program such as: whether lubricants should be purchased in larger quantity for economy; downtime of equipment; inadequate lubrication devices, etc. The next four steps in the lubrication standardization program cover engineering and administration of the program.

STEP 7—SELLING THE PLAN TO ENGINEERING

In order for a program such as presented here to be effective it is necessary that all engineering groups be given a complete summary of the objectives. They must be kept informed periodically, so to speak, of the progress of the overall program. Placing others on the team will greatly assist in the rapid progress of establishing uniform control of the new lubrication procedures.

STEP 8—MAINTAINING COMMUNICATION

In order to function properly, direct communication must be maintained between the lubrication engineer, the maintenance engineer, the maintenance supervisor
(Continued on Page 101)



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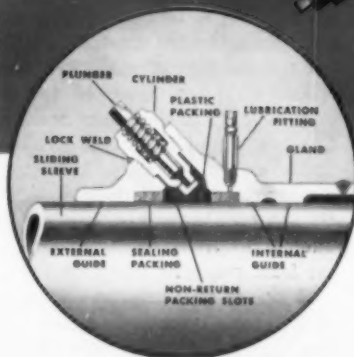
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How to Avoid Boiler Feedline Deposits

By

GEORGE A. WILHELM
Betz Laboratories, Inc.

BOILER FEEDLINE deposits have long been and still are one of the operational problems frequently encountered in the production of steam whether it be in industry, in utility plants or in simple heating jobs. The problem is more serious, of course, in some plants than in others.

Hardness in the feedwater causes scale deposits to form on boiler heat exchange surfaces. In similar fashion, caused by temperature increases, hardness can also deposit scale in boiler feedwater lines. The problem is not unusual in boiler feedwater systems using the effluent from hot or cold lime-

soda or hot phosphate softeners as 100% makeup. After-precipitation in the effluent from filters following the lime-soda units and less than top efficiency in filter operation after hot phosphate units frequently result in feedline deposits. Serious corrosion in condensate return systems contribute to or may be entirely responsible for the same difficulty.

Hardness in water is due to the soluble salts present. Cations such as calcium, magnesium, iron, aluminum, manganese, etc., produce hardness while anions such as chlorides, sulfates, nitrates, carbonates and bicarbonates do not

add to the hardness, but only to the dissolved solids content of the water.

The principal hardness producing salts are those of calcium and magnesium with iron and aluminum contributing only to a small degree in some waters. Normally, however, salts of iron and aluminum together with the salts of other heavy metals produce so little increase in hardness that hardness in water is generally taken as the sum of the calcium and magnesium ions expressed in terms of calcium carbonate.

In boiler plant operation, high hardness in the raw water should be lowered by external treatment such as cold lime or lime-soda softening, hot lime or hot lime-soda, hot lime-hot zeolite or by cation exchange zeolite softening. The external treatment system chosen should be carefully engineered for each job so as to provide the best makeup water for each plant's operating conditions at the least cost based upon the expected life of the plant.

Reasonable hardness content of the makeup water can be satisfactorily controlled by use of proper internal boiler feedwater treatment. Proper use of the available inorganic precipitating agents such as the phosphates and either soda ash or caustic soda together with organic sludge conditioning agents will assure the precipitation of feedwater hardness in the boiler water and the formation of a fluid and non-adherent sludge.

Even with external treatment properly applied, however, deposits may develop in the boiler feedline. This condition is always troublesome and frequently can prove dangerous if deposits develop to the extent that they prevent an adequate supply of boiler feedwater from reaching the boilers.

Deposits also interfere with the rate of heat transfer in closed heaters or economizers and cause a considerable loss in thermal effi-

Fig. 1—Sections of 8-inch diameter feedline showing calcium phosphate deposits.



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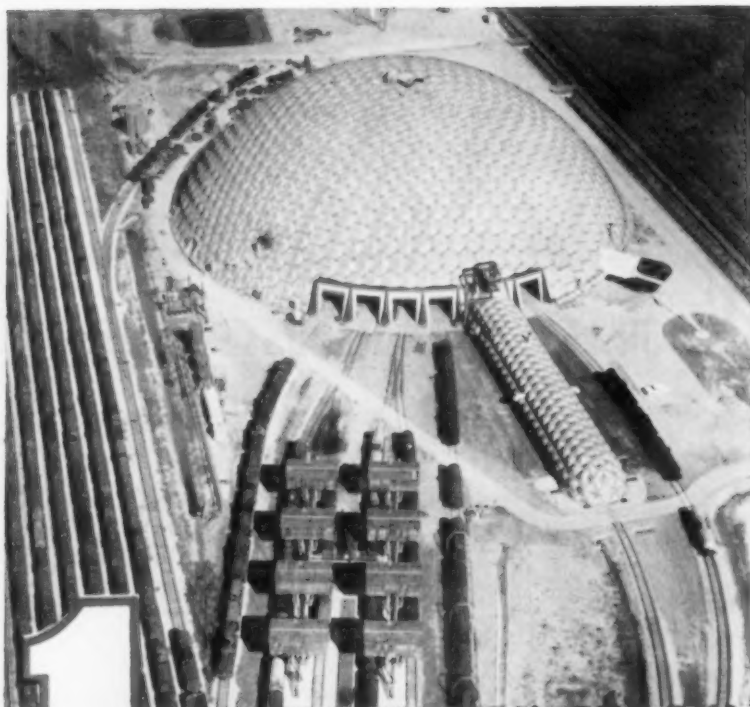
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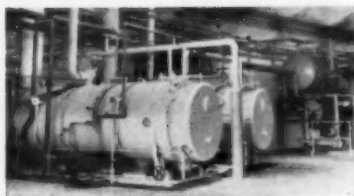
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ciency. Further, in order to overcome the friction loss caused by the deposits, increased boiler feed pump pressure is required.

Feedline deposits may also interfere with the normal operation of automatic feedwater regulators causing abnormal changes in boiler water level, carryover of boiler water solids in the steam, or low water damage.

Calcium carbonate and calcium phosphate are the most common constituents of deposits in boiler feedlines. Iron oxides may also be present and occasionally, under unusual conditions, deposits of calcium silicate, magnesium silicate and organic compounds of calcium and iron, such as the tannates, may contribute largely to the total deposit. Feedline deposits may also arise from mechanical conditions which permit silt, bits of cloth, gasket material, filter medium and other debris to enter the boiler feedwater system.

Calcium Carbonate

Deposition of calcium carbonate in the boiler feedline will result when the pH of saturation of calcium carbonate is exceeded. The pH at which a water is saturated with respect to calcium carbonate may be calculated by means of Langelier's Equation. This equation, which taken into consideration such factors as pH value, calcium ion concentration, total alkalinity, total dissolved solids and the temperature at which the water is used, permits prediction with remarkable accuracy as to whether calcium carbonate deposits will be laid down.

When the actual pH of the water minus the pH of saturation (determined by Langelier's Equation) is a positive value the water is oversaturated with respect to calcium carbonate and calcium carbonate deposits will be formed.

Conversely, if the actual pH of the water minus the pH of saturation is a negative value, the water is undersaturated with respect to calcium carbonate and no deposition will take place.

Nomographs have been prepared, based on Langelier's Equation, which permit the pH of saturation of a water to be readily determined when factors are known.

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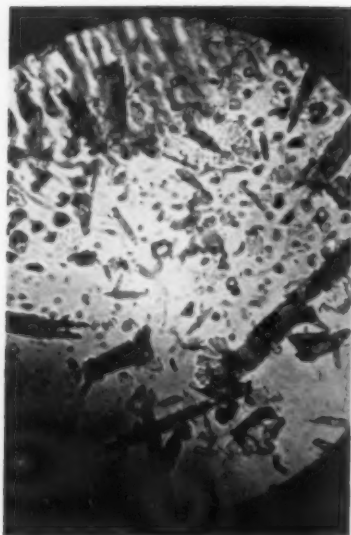


Fig. 2 — Calcium carbonate scale crystals at 450 magnifications.

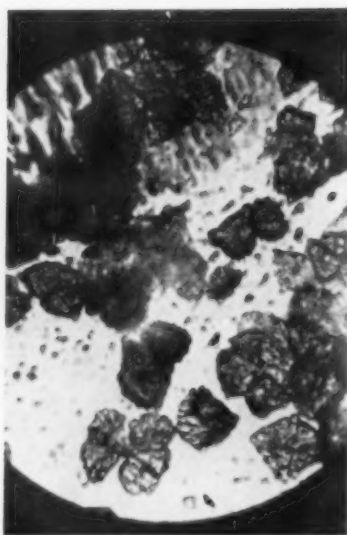


Fig. 3 — Distortion of crystals by feed of an organic surface active agent.

soda softener units, operating either in the cold or hot process, is saturated with respect to calcium carbonate at the temperature of the softening operation. Since the solubility of calcium carbonate decreases with an increase in temperature, calcium carbonate will be precipitated from solution and deposited as scale in closed heaters and economizers when feedwater temperature increases through these units.

The tendency for precipitation of calcium carbonate is reduced when the softened water, after filtration, is diluted with condensate return for reuse as boiler feedwater. The condensate should be added to the softened water after filtration since, if introduced prior to the filters, it will merely redissolve the suspended calcium carbonate and may not relieve the condition of calcium carbonate saturation in the filter effluent.

Raw water, high in hardness due primarily to soluble bicarbonates, frequently causes feedline deposits when used for boiler feedwater makeup. For every temperature, an equilibrium condition exists between the free carbon dioxide content of the water and the amount of calcium bicarbonate that can be held in solution. Even the slightest temperature increase, in some cases, is enough to offset equilibri-

um and result in precipitation of calcium carbonate deposits on heater trays, feedwater lines and in the boiler feed pumps.

Soda ash and caustic soda are frequently used to establish and maintain proper boiler water alkalinity and pH values. When fed continuously to the boiler feedline the equilibrium mentioned above is upset, since both tend to increase the alkalinity and pH of the feedwater, and often result in deposition of calcium carbonate even when feedwater temperature is slightly lowered by heat losses through piping.

However, where closed heaters or external economizers are in use, the continuous feed of alkaline materials to the boiler feedlines will definitely cause calcium carbonate deposits except where the hardness of the feedwater is low, as in the case of an effluent of a properly operating sodium zeolite softener.

In cases where appreciable hardness is present in the feedwater, the pH of saturation of calcium carbonate is exceeded by continuous feed of soda ash or caustic soda. The result is the precipitation of calcium carbonate from solution and the formation of deposits in the boiler feedline.

Any method which will lower the pH of saturation will reduce

the possibility of feedline deposits. Recarbonation, continuous and carefully controlled feed of acid and use of inorganic and/or organic surface active agents are methods commonly used in control of this problem.

The recarbonation process simply consists of passing carbon dioxide gas through the water for the purpose of stabilizing the pH of saturation and thus preventing precipitating of calcium carbonate. Where municipal supplies are lime or lime-soda softened before distribution, recarbonation is commonly used to hold calcium carbonate in solution.

Carbon dioxide added during recarbonation tends to convert the scale forming salts to their more soluble forms, reducing their tendency to precipitate. In the softening process, excess lime (calcium hydroxide) is converted to calcium carbonate. The calcium carbonate and the magnesium hydroxide remaining in solution to the limit of their solubility in the softener effluent are converted to the soluble bicarbonates of calcium and magnesium by reaction with carbon dioxide.

Carbon dioxide may be obtained from various sources such as natural gas and producer gas made from coke. Under certain conditions, stack gases may be satisfactorily used. Generally, any gas containing 4% or more of carbon dioxide can be used successfully for recarbonation.

The continuous and proportional feed of acid, usually sulfuric acid, to a lime or lime-soda softened makeup water relieves the oversaturated condition with respect to calcium carbonate and will prevent deposition in the boiler feedwater systems. However, careful control of acid feed is a "must" and proper feeding equipment is necessary to avoid the obvious hazards of acid treatment.

Where inadequate acid feed systems are used or insufficient attention is given, acid feed can be extremely dangerous to plant personnel and equipment. Makeshift feeding equipment is definitely not recommended for this purpose.

A much less hazardous and more commonly used method of preventing feedline deposits is the use of inorganic and/or organic



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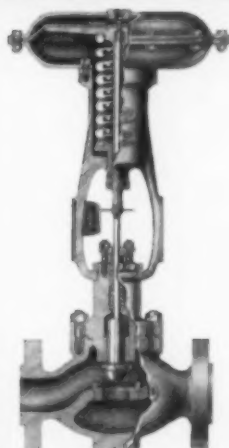
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1½	1.5	3.4	5.2	12	25					
2	1.5	3.4	5.2	12	25	46				
3				12	25	46	110			
4					25	46	110	195		
6						46	110	195	400	
8							110	195	400	640
10								195	400	640 1000

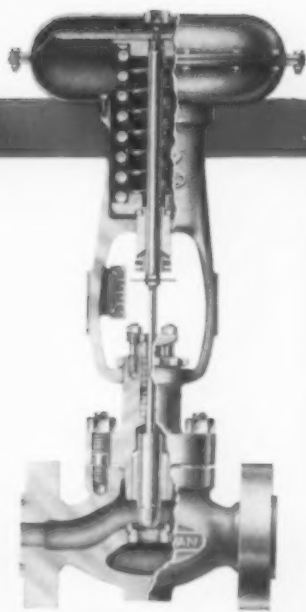




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surface active agents. Relatively small concentrations of the surface active agents, usually not more than 10 ppm, will serve to retain calcium carbonate in solution even when an oversaturated condition exists.

In municipal water distribution systems, deposits have been successfully controlled by addition of polyphosphate and/or other surface active agents. Concentrations of as little as 2 ppm have been adequate to inhibit precipitation of calcium carbonate and prevent deposition. The feed of polyphosphate and other surface active agents to boiler feedwater has also been successful in preventing boiler feedline deposits. Equipment for the feed of these materials to the boiler feedline can be relatively simple in construction and inexpensive.

The use of inorganic or organic surface active agents to prevent deposition is dependent on the power of the surface active agents to inhibit precipitation of calcium carbonate. The crystal distortion produced by organic agents is a large factor in retarding precipitation of calcium carbonate. Figure 2 shows, at 450 magnifications, calcium carbonate crystals formed at a heat transfer rate of 17,000 Btu per square foot per hour. Figure 3 illustrates the distortion of the crystal formed under the same conditions produced by feed of an organic surface active agent.

The various tannins, lignins and other surface active agents have shown considerable power in inhibiting calcium carbonate deposits in boiler feedwater lines. In many instances, best results have been secured through the use of blends of several of the surface active agents.

Calcium Phosphate

Deposits of calcium phosphate are frequently encountered in boiler feedwater lines. These deposits may result from several sources. Where the feedwater supply is the effluent from a hot phosphate softener, any increase in temperature after the softener will result in further precipitation of calcium phosphate in the feedline. Calcium phosphate may also be precipitated in the feedline where ortho phosphate is fed continuously or,

in some cases, even with shot feed of ortho phosphate through the boiler feedline.

Hot phosphate softeners are used in conjunction with hot lime-soda softening units. The alkalinity in the lime-soda effluent water is used to provide the necessary alkalinity to permit precipitation of calcium phosphate in the hot phosphate unit.

Since the operation of the hot phosphate unit requires an excess soluble phosphate, usually about 5 ppm to 10 ppm in the effluent water, this excess plus the alkalinity are the cause of after-precipitation of calcium phosphate in the boiler feedline with temperature increases.

Continuous or intermittent (shot) feed of phosphate of some type to the boiler feedline can cause feedline deposits of calcium phosphate. When the phosphate so fed is in the ortho form, the probability of calcium phosphate deposits increases. Even with the use of the glassy type of phosphates some reversion may take place and deposits develop. Some of these phosphates may revert more readily than others.

Thus, dependent on calcium hardness, temperature and retention time serious difficulties may arise when phosphates are fed continuously or by shot fashion through the boiler feedline. Introducing the phosphate only a few feet outside of the boiler drum does not prevent deposition of undesirable magnitude over a period of time. The speed of deposit formation is dependent on feedwater calcium hardness.

If zeolite softening is used or if the makeup water is of naturally low hardness the speed of deposit formation is greatly reduced or prevented entirely.

The tendency for precipitation of calcium phosphate from the effluent of a hot phosphate unit may be considerably reduced by dilution with condensate recovered for reuse as feedwater, provided the condensate is added after the filters. Addition of the condensate before the filters would only serve to dissolve some of the suspended calcium phosphate in the softener effluent and the filter effluent would remain saturated with calcium phosphate.

Acid is frequently used to prevent deposition of calcium phosphate in the feedline. As with lime-soda softener effluents, a reduction of the alkalinity and pH values by the proportional feed of acid will bring about an undersaturated condition and calcium phosphate will not be precipitated from solution. The feed of the proper surface active agent or combination of surface active agents may also prevent calcium phosphate deposition.

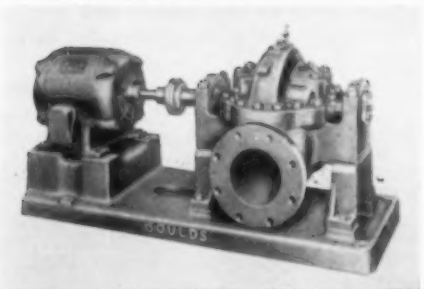
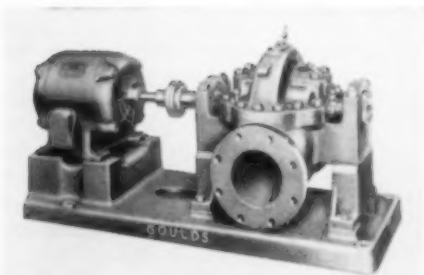
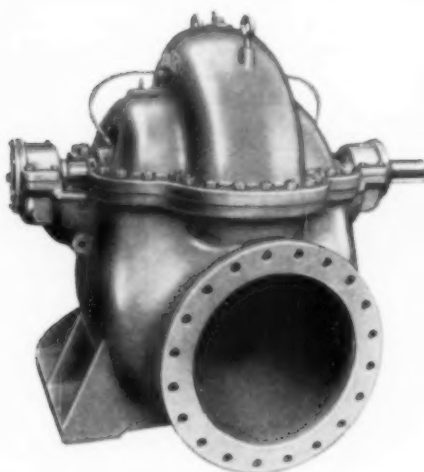
The best method of introducing phosphate to a boiler water is by feeding continuously directly to the boiler drum, employing a small chemical pump. If it is not possible, for some good reason, to feed by this method it becomes necessary to resort to shot feed or to feed intermittently to the boiler feedwater line. This is usually accomplished by use of a by-pass shot feeder or by a time controlled high capacity chemical feed pump.

If treatment, required in large quantity, is added to the boiler feedline in a short period of time, the tendency to deposit calcium phosphate is reduced. It is of much importance, therefore, to make certain that the shot of treatment is added in a true shot fashion. Otherwise calcium phosphate will be precipitated and the method of feed would have the same objections as the continuous feed of phosphate to the boiler feedline.

Feedline deposits may be inhibited by feeding certain organics or combination of organics with a phosphate type treatment. Where the feedwater is of low hardness, deposits can be prevented by this method.

However, from an operating standpoint, it is not satisfactory merely to reduce the precipitation and formation of deposits of calcium phosphate since this only extends the eventual plugging of the feedline. The treatment must be formulated carefully to completely overcome any tendency of calcium deposition, either as the phosphate or carbonate, so that it does not become necessary to regularly clean the boiler feedline.

This requires a careful and complete evaluation of all factors involved before a prediction can be made with any degree of accuracy



Which pumping system is for you?

Phil Olmstead,
Chief Engineer, Goulds Pumps, Inc.
tells you how to find out



The mammoth pump you see here—Goulds Fig. 3420—can handle up to 40,000 gallons per minute! Think of it—enough to fill an average-size swimming pool in less than a minute!

Yet with two or more smaller pumps in parallel—such as the Goulds Fig. 3405 centrifugals, also shown here—you could fill that swimming pool just as fast, though your strength would be divided.

Which is the most effective way to do it?

ONE PUMP?

1. With the Fig. 3420, you make just one installation, thereby save installation time.
2. Your installation takes up less space.
3. Your piping is simpler and less expensive.
4. You pay a lower initial cost: one pump, one driver, one coupling.
5. Your operating costs are lower. Big pumps have inherently higher operating efficiencies; you save on power.
6. You service just one pump; maintenance costs are lower.

TWO PUMPS?

1. During critical periods, having a *battery* of Goulds Fig. 3405 centrifugals can save the day: all "eggs" are *not* in one "basket."
2. The flexibility of two pumps lets you accommodate varying needs more efficiently.
3. Smaller pumps are easier to handle, therefore easier to install and maintain.

These points might make you wonder which system *is* right for your needs specifically. To be sure *all* important considerations are covered before you make your final decision, call in a pump specialist. Goulds application engineers help pump users make decisions like this all the time, will be glad to help you determine which system most accurately, economically and efficiently meets your needs.

I can help you get in touch with a Goulds application engineer if you write to me, Phil Olmstead, Goulds Pumps, Inc., c/o Dept. SP-50, Seneca Falls, N. Y. I'll also forward any information you might want on the pumps I've mentioned.

GOULDS  PUMPS



RETURN LINE CORROSION *Can* BE LICKED!

Drastic reduction of return line corrosion in an easy, effective and economical way has been the unanimous experience of hundreds of plants throughout the country using Bird-Archer's Amine Treatment.

A plant in New York State, generating approximately 500,000 lb. of steam a day, had a normal condensate pH value of 6.3 that resulted in almost constant piping replacements. Only 6 lb. per day of Bird-Archer's Amine Treatment cut maintenance costs to a new low by raising the pH value to the safe range of 8.0 to 8.5.

A plant in New England, generating 600,000 lb. of steam a day, did not have an open feedwater heater which would mechanically eliminate the exceedingly high CO₂ content of their makeup water, consequently, the pH value of their condensate was sometimes as low as 5.9. Less than 12 lb. of Amine Treatment a day raises the pH value of the condensate to 8.5, eliminates excessive corrosion.

After two years of experience with Amine Treatment a power plant in Massachusetts, making 250,000 lb. of steam a day, enthusiastically reports that they eliminate over 75% of their piping replacements through the use of only 2 or 3 lb. a day of Amine Treatment.

Return line corrosion has been licked at these plants. Let a Bird-Archer Service Engineer help you solve *your* corrosion problems.

Write for Bulletin CP100 and the name of the Bird-Archer Service Engineer nearest you.

8A-801



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that phosphates can be fed continuously through the boiler feedline without fear of feedline deposits.

Iron Oxide

Iron oxides also contribute to or may be entirely responsible for feedline deposits. Iron, present in well supplies used for boiler feedwater makeup, will be precipitated by the increase in temperature and deaeration of the feedwater in the feedwater heater.

The increase in pH value of the feedwater as it passes through the heater, caused by the expulsion of free carbon dioxide and breakdown of bicarbonate alkalinity of the feedwater to produce carbonate alkalinity, will precipitate the iron from solution as a finely divided precipitate of ferric hydroxide.

Intermittent boiler operation, where the boilers are out of service overnight and/or over week-ends, causes a more rapid build-up of this precipitated material in the feedline as well as in the feedwater regulators. Iron may be present in the feedline deposits as a result of corrosion of the line at the point of deposit formation. The deposit may also be present as a result of corrosion in steam and return lines.

Oxygen and/or carbon dioxide in the condensate systems cause serious corrosion in the return system. Oxygen may enter the return system through incomplete deaeration in the feedwater heater or by faulty operation of traps, receiver vents, valves, etc., in the return system.

Oxygen cannot be completely removed from boiler feedwater supplies through mechanical deaeration even with the most efficient type of deaerator. However, a combination of mechanical and chemical methods can satisfactorily remove all traces of oxygen ahead of the boilers and prevent corrosion in the boilers and return system.

Sodium sulfite and hydrazine are chemicals normally employed for oxygen removal. These materials are usually fed into the storage section of the feedwater heater in continuous fashion in quantities sufficient to react with the oxygen

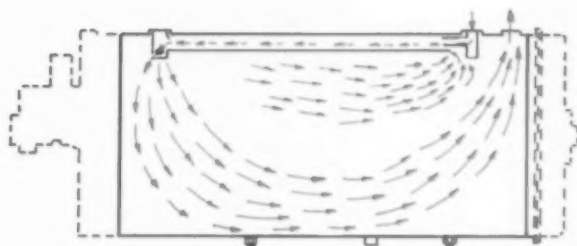
(Continued on page 54)

NEW from Superior... a boiler with **Venturi-Action Mixing Tube**

for
**Hot Water
Heating**



For details of the Type CC,
the answer to trouble-free hot
water heating, write for
Catalog CC-15.



Unequal circulation within the boiler . . . a problem of serious consequence in hot water heating . . . has been overcome by a newly developed Venturi-Action Mixing Tube which is an integral feature of the new Type CC. The tube plays a triple role:

- (1) It starts by mixing entrained water from the boiler with water entering the boiler.
- (2) As this mixture travels through the tube, its temperature is further modified by surrounding water.
- (3) Jet action at the end of the tube, where flow is directed down and outward at the boiler front, provides an unequalled full-length boiler circulation pattern.

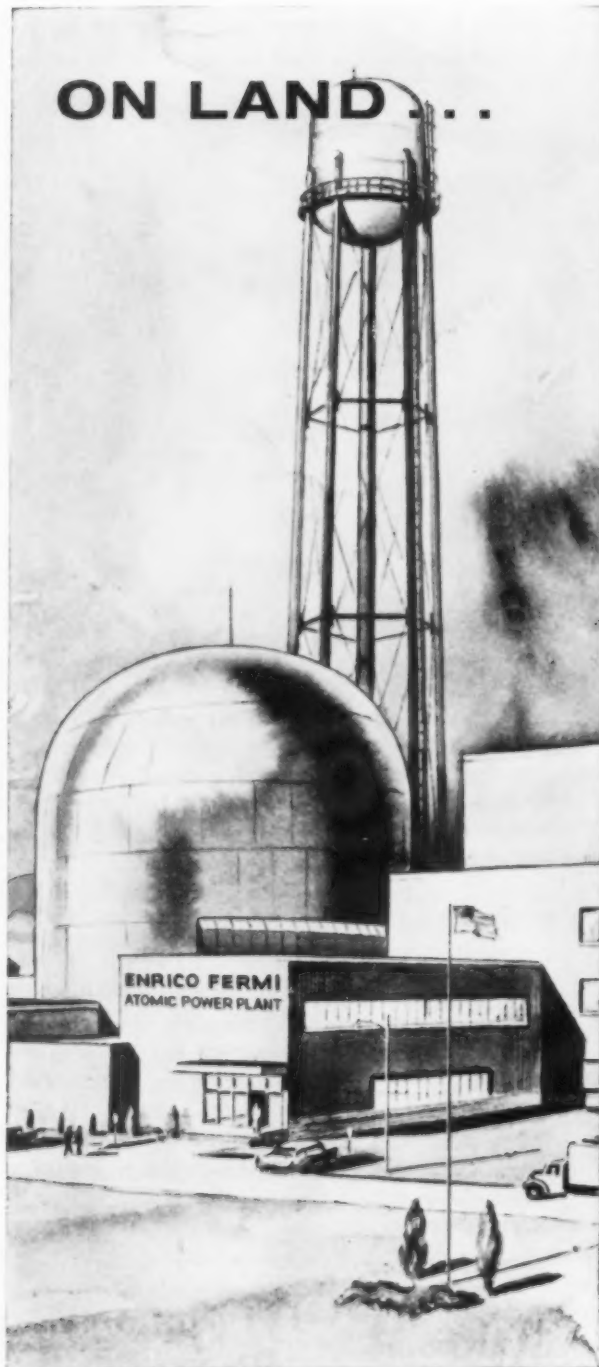
This flow pattern was carefully traced time and again by means of thermo-couples which proved that the mixing action achieved was unequalled in any other hot water boiler.

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ON LAND ...



At the Enrico Fermi Atomic Power Plant, instruments and controls for both the "fast neutron breeder" reactor and the steam plant which it will "fire" are being furnished by Bailey.

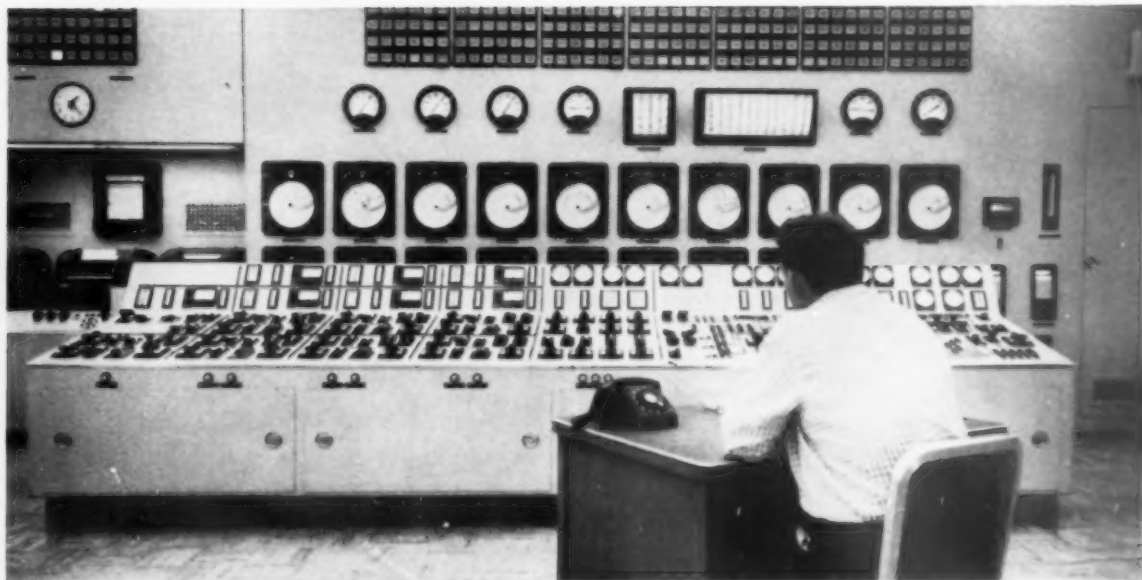
OR SEA ...



Many of the new ships such as this super-carrier, USS Ranger, operate their boilers by Bailey Meter Control. Cargo ships, tankers, and passenger liners as well as Naval ships improve the economy and safety of their steam plants thru use of Bailey controls.

At the Thomas H. Allen Electric Generating Station of the City of Memphis, Tenn., Bailey operating indicators and controls for combustion, feed water, and steam temperature are centralized on the mechanical bench-board directly ahead, while the operating records which reflect trends are mounted on the vertical boards. A Bailey METROTYPE Information System, center left in the photo, scans, monitors, and logs functions usually assigned to strip-chart recorders.

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unnecessary expense of over-instrumentation or control . . . nor the duplication of equipment functions.

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A144-2



Instruments and controls for power and process

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prior to the entry of the feedwater to the boilers.

Carbon dioxide produced in the steam by decomposition of carbonate and/or bicarbonate ions in the feedwater is reabsorbed in the condensates forming carbonic acid.

Carbonic acid is a weakly ionized acid, but is decidedly aggressive toward metals usually present in condensate return systems. Iron, taken into solution by corrosion in the return systems, is precipitated in the feedwater by the same conditions which cause precipitation of iron from the feedwater when a well supply containing iron is used for feedwater make-up.

Iron may be removed from raw water by means of several different methods or combination of methods. Oxidation by aeration or chemical reaction followed by coagulation, sedimentation and filtration will produce an effluent water satisfactorily low in iron content.

The external treatment of the raw make-up water to reduce hard-

ness and/or alkalinity, will also reduce iron content. A reduction in carbonate and bicarbonate alkalinity in the makeup water will reduce feedwater alkalinity, thereby reducing the amount of carbon dioxide produced in the steam, return line corrosion and the iron content of the feedwater.

Recently, after-treatment of the steam to prevent carbon dioxide attack has been highly successful in reducing return line corrosion. Filming amines and neutralizing amines are most widely used as after-treatments in controlling this problem.

Filming amines, which function by establishing a non-wettable film on metal surfaces in the condensate system, will protect the return system from both carbon dioxide and oxygen attack. Neutralizing amines react directly with carbon dioxide produced in the steam and are effective only against carbon dioxide attack.

The causes of feedline deposits, whether due to calcium carbonate, calcium phosphate or iron deposits

are well known as are the methods required to inhibit or entirely prevent their formation.

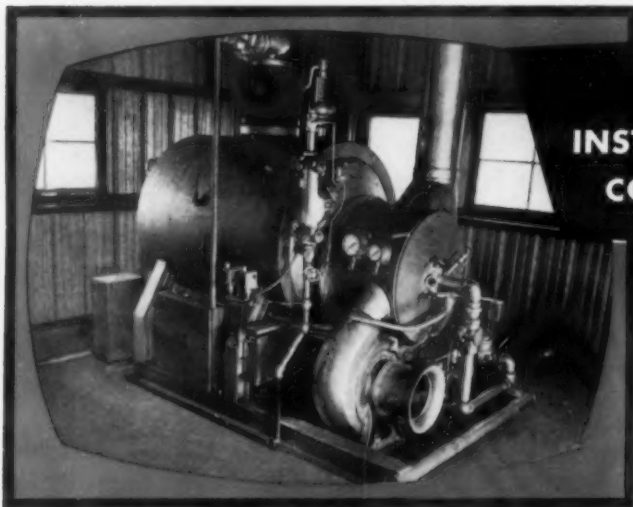
The most important factor is the true evaluation of the problem and that the corrective measures taken be engineered to fit the particular needs of the plant involved.

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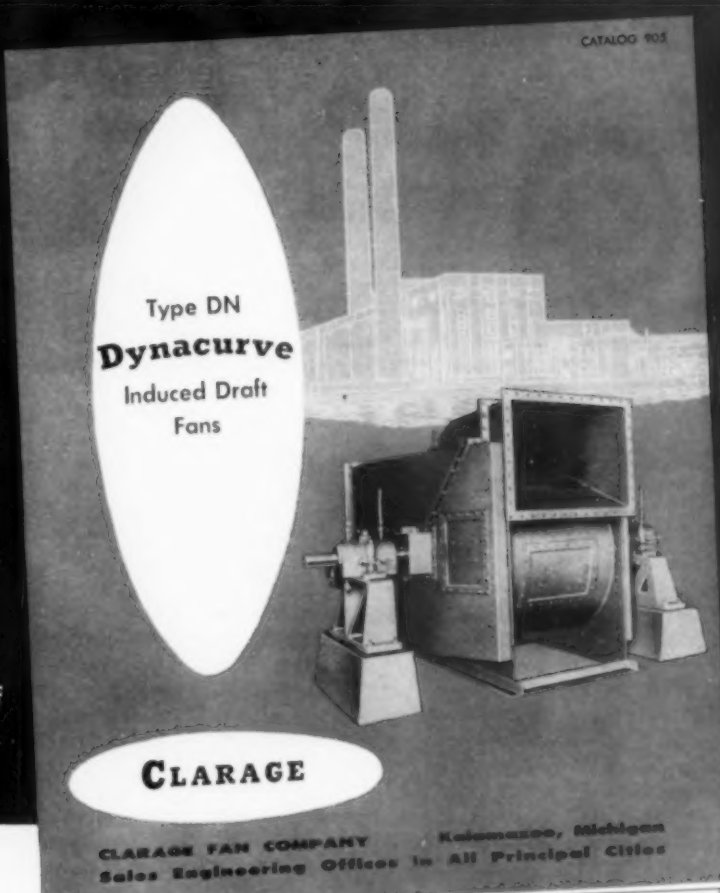
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SOUTHERN POWER & INDUSTRY for MAY, 1960

For more information, use Reply Card—Page 85

55

Instrument Engineering With Maintenance in Mind

By E. S. YARLETTS

Supervisor of Instrument Engineering
The Lummus Company, Houston, Texas.



INSTRUMENTATION occupies an increasingly critical relationship to total operating cost. The control system that meets all the performance requirements is just one factor in a satisfactory system design. It must also be sufficiently reliable to minimize downtime as much as possible.

A great deal has been written concerning the design of reliable systems, and I am sure you fully realize that reliability depends to a great extent on the ability of a service man to neutralize, directly or indirectly failures and shut-downs.

The broad scope of responsibilities attached to instrument maintenance will vary from plant to plant, but, in general, it can extend from complex computer and data handling systems to changing recorder charts.

Control system downtime can be very costly, and frequent interruptions can also cause operators to lose confidence in a system, and in a great many cases refuse to use it. Therefore, the control engineer must design to reduce failures by the selection of equipment and installation techniques, and to make it easy to locate trouble and make repairs.

The following discussion includes some basic characteristics of equipment and practical tips to minimize system interruptions and reduce downtime.

The control of flowing material produced and distributed in a plant depends to a great degree upon the accuracy and reliability of flow measuring devices. The instrument most frequently selected for this application is the differential pressure type.

Flow Control

In measuring flow by means of a differential pressure drop, the primary flow element, which is inserted directly in the pipe, must be selected and designed to suit the exact conditions which exist for each installation.

Liquid flow should be measured at the point of highest pressure and lowest temperature to prevent vaporization. Saturated gas measurement should be avoided. Gas flow should be measured at the highest temperature and lowest pressure whenever possible to eliminate entrained liquids.

The three most frequently used differential producers or primary elements are the thin plate orifice, flow nozzle, and the venturi tube.

There is so much published data available concerned with the application, sizing, manufacture and installation of the fore mentioned primary elements, I do not feel it necessary or advisable to give a detailed discussion on this subject.

In general, we have found the thin plate concentric orifice is applicable for the majority of flow

metering problems. For applications where small amounts of non-abrasive solids are present, i.e., five per cent or less, the eccentric orifice plate has a specific advantage. In addition, it is useful for measuring liquids which carry a small amount of gas, or for vapors or gases that carry small amounts of liquids. In either case, the orifice opening must be located at the top or the bottom of the pipe and the taps must be at 180 degrees or 90 degrees to the eccentric opening.

The flow nozzle will handle 60 per cent more flow than an orifice of the same diameter; therefore, it is more suitable for measurement at high velocity. In addition, due to its formed inlet, it is preferable to the orifice plate for handling fluids with small amounts of entrained solids and non-homogeneous material.

The venturi tube is generally applied for measuring liquids containing large concentrations or solids, and where horsepower is a factor, due to its small permanent pressure loss.

Although there is very little data available from commercial use, the round edge or quadrant orifice plate appears to be a very practical method of measuring viscous liquids. The orifice edge has a rounded approach on its upstream side making it practically insensitive to viscosity changes as long as

the throat Reynolds Number does not exceed two hundred and fifty thousand. For all practical purposes, it has a constant coefficient over the Reynolds Number range of five thousand to two hundred and fifty thousand. For those of you who wish a further study of this device, Taylor or Foxboro Instrument Companies can supply information.

The force-balance diaphragm type differential pressure device is generally used for flow measurement where transmission is necessary. Due to its minute displacement requiring such a small quantity of fluid to be transferred for the differential change, it is unwise to dampen pulsating flows at the valves in the hydraulic lines. The piping should be left wide open to the transmitter and damping applied to the output. We have found the liquid filled bellows deflection type more suitable for pulsating flow, and in addition, all those applications of flow measurement not suitable for the force-balance diaphragm type.

The magnetic meter, although not a head metering device, will give very satisfactory results for metering all types of liquids that are electrically conductive, and it

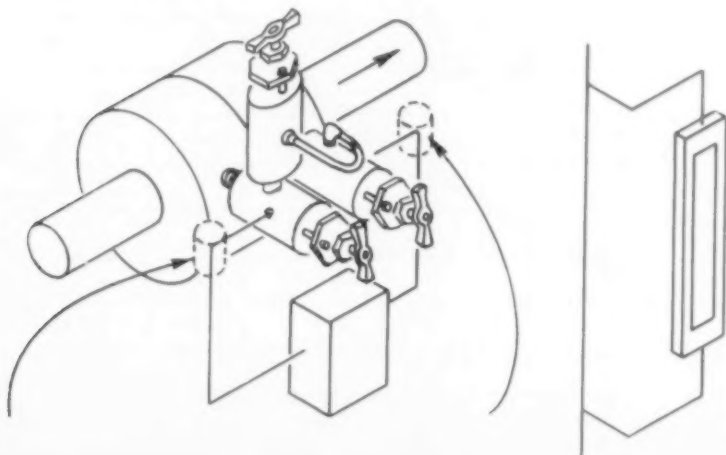
is an excellent selection for those materials containing large percentages of sticky solids. Its accuracy is unaffected by Reynolds Number or viscosity, solid materials content, or by a wide range of velocity distribution patterns.

The variable area flow meter certainly must be considered, although its application to flow measurement has been used mostly for what is considered the hard to handle materials such as high temperature heavy viscous streams solids bearing and toxic streams, and corrosive and hazardous streams. Some of the outstanding features are a high degree of inherent accuracy and reproducibility, wide rangeability, and linear flow scale.

The use of seals, continuous purge systems, and steam tracing should be avoided wherever possible by selecting other suitable available instruments. Volumetric filled, permanently sealed systems can be used for protection with very satisfactory results to increase reliability and minimize maintenance difficulties. Filled systems consisting of a metallic diaphragm at the sensing point with liquid filled permanently sealed capillary tubing to the measuring device are available for pressure measurement, flow measurement, and level measurement.

View at left, diaphragm seal and volumetric filled capillary tubing in place of steam tracing or seals; and male end valves in lieu of pipe nipples and fittings with close couple piping to meter.

Right—Piping swing should be provided to prevent breakage of connecting nipples when operating temperatures exceed 450 F.



Shut-Down Devices

Automatic shut-down devices should be used only where extreme emergencies exist for the protection of equipment and where an operator would not have sufficient time to make the necessary corrective action manually. If an automatic shutdown system is felt necessary, all components and wiring should be separate from any other control circuit or measurements to simplify maintenance and prevent serious spurious shut-downs.

Level Control

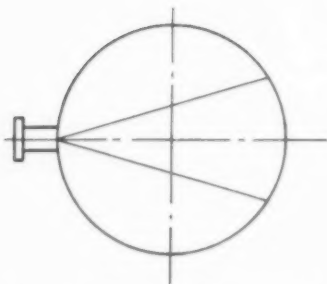
A gauge glass acts as a condenser when operating at a lower temperature than the tower to which it is attached. Long sections can cause breakage of nipples connecting the gauge glass to the tower, or if the gauge glass is removed for repair, it is very often found impossible to match the connections of the gauge glass to the vessel for replacement due to the differential expansion.

It has also been found that the gauge glass in high temperature service will give a misleading high reading. Per cent of high reading observed is dependent upon its length and size of free opening in the gauge glass column.

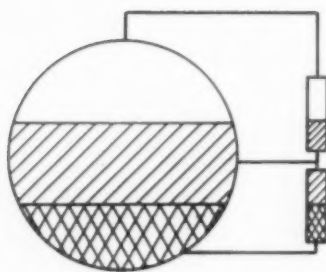
It is our practice never to exceed a gauge glass length of more than four feet. It can be very advantageous to specify level gauges with the same length gauge glasses throughout your plant; this will reduce warehousing to a minimum and most certainly benefit maintenance.

Level measurement of low boiling materials, that is, materials that boil at atmospheric temperature at operating pressure, can very effectively be measured by use of the differential meter. The cold fluid exposed to the atmosphere in meter leads will vaporize, thereby eliminating the use of seals or continuous purge.

The use of torque tube type level instruments should be discouraged when high velocity exists at the inlet or outlet piping. High velocity can set up harmonics with the torque tube and cause the instrument to be useless. We have experienced similar trouble with other devices which require a



Select vessel level connections to prevent liquid or vapor-liquid impingement.



Three vessel connections can be used for measuring two immiscible liquids.

flapper and nozzle control pilot such as ball floats. This type of equipment was replaced by differential pressure instruments to correct the trouble. Applications where this trouble is found to be most common are compressor dry drums, evaporators, and flash drums.

External displacer type liquid level controllers in steam stripper applications can be extremely troublesome if not properly designed. The displacer will bounce up and down in the float cage caused by drops of water condensing on the top inside surface of the float cage, dropping to the bottom where they hit the oil, flashing the water to steam. This causes a sudden pressure rise in the cage, forcing the liquid level down with an almost immediate rise.

Usually this bouncing will cause the float arm to hit the mechanical stop, breaking the float arm or rupturing the torque tube. The most effective method to eliminate this is by the use of gas purge, or if gas purge is not available, steam tracing the float chamber may suffice.

Connections for level measurements should be located so that vapor or vapor liquid mixtures are not directed from feed nozzles so as to impinge and cause errors of measurement.

The location of connections in vessels for level measurement of two immiscible liquids must be set very carefully for best results, in most applications three connections will suffice. In this case, the bottom connection should be in the heavier material, and the top connection should be above the lighter material. An intermediate

connection is installed above the maximum interphase level expected and below the minimum level of the lighter liquid. This will permit both levels to equalize and give satisfactory readings. The bottom connection should be in the side of the vessel rather than in the bottom for self draining.

The use of capacitance for accurate level measurements has become very useful for measuring level of granular solid material, liquid oxygen, liquid nitrogen, liquid hydrogen, and many of the so-called hard to handle materials. Maintenance on the primary element should be small — leaving

only the electronic circuit as a maintenance problem.

The use of radioactive material is also becoming useful for accurate level measurement and should be investigated for applications where corrosive, highly toxic, slurry, or granular solids materials are involved.

Temperature Measurement

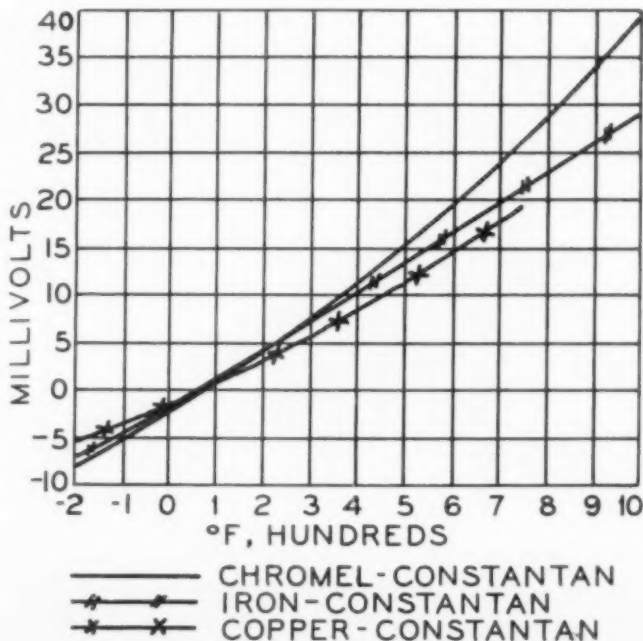
Standardization of thermocouple and thermometer well lengths can save many man-hours searching for a thermometer of suitable stem length and will permit standardization of thermocouple lengths. This also will again help to simplify and reduce warehousing.

Where difficulty is expected because of the oxidation of the iron wire in an iron constantan thermocouple, or a dual range instrument is not desirable, a very little publicized thermocouple can be used, the chromel constantan couple. This thermocouple has very good thermo-electric characteristics over a range from subzero temperatures to plus 100 F.

Pneumatic Instruments

To get the best results from pneumatic instrumentation, they must have a continuous, clean and

Chromel-constantan thermocouples can be used in lieu of iron-constantan where the iron wire may cause trouble.



dry supply of air. Pneumatic instruments are designed for precision service; therefore, they must contain extremely small nozzles, orifices, and restrictions. A precisely machined orifice, designed to pass air at a certain rate, will not pass liquid at the same rate. The instrument response will be greatly affected by moisture in air lines.

Electronic Controls

The fast moving processes of today, together with the design of integrated units and central control rooms, have brought about the development of the electronic control systems.

To simplify trouble-shooting and repair, most of the instrument manufacturers use the modular plug-in construction. This type of construction certainly has considerable merit because, by the process of a systematic component elimination, a faulty component can be easily located and replaced.

This system of construction does have some disadvantages; it reduces reliability somewhat due to the use of pressure contacts, and at times increases circuit complexity. Also the pressure contacts are usually goldplated and, at times, under extreme corrosive conditions it was found the plating had been unknowingly removed by service men, exposing the copper.

Wiring

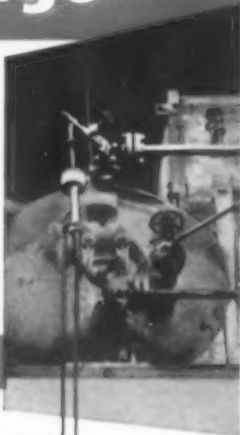
Wiring should be run without intermediate junctions whenever possible. Continuous color-coding and complete wire identification becomes almost a necessity to aid the instrument service man in trouble-shooting procedures.

Since electronic instruments are normally wired with small diameter wire, it becomes advantageous to use stranded wire to eliminate broken conductors caused by line vibrations in the process area.

The use of high quality spade type, pressure connected lugs for wire termination at the instrument terminals and intermediate junction blocks will aid the service man in any necessary disconnecting procedures for circuit isolation, as well as provide an excellent means for visible well terminated wiring. Lugs that grip wire insulation, as well as the conductor itself, will again help prevent

Why a remote reading gage

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- Remote gage saves thousands of steps, hours of valuable time. Brings gage reading *down to eye level* at safe distance from boilers.



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broken conductors. This type of wiring technique will simplify the complete system and permit much easier trouble-shooting.

Pipe Connections

There are now available, male end angle valves for connecting pressure and flow instruments at sensing points in lieu of pipe and fittings, which greatly simplify an installation and reduce leakage problems.

To keep warehousing to a minimum and simplify maintenance, the number of different types and ratings of valves and fittings should be kept to a minimum.

Connections for tower pressure controllers operating at 0 psig or less should not be located at the bottom of the tower. The changing liquid head in the tower will cause irregular errors in the measuring device upsetting the controller. Usually the small change in head will not seriously affect pressure measurement of towers operating at higher pressures.

Final Control Elements

The selection of the proper final control element can be a major factor in the engineered solution of a control problem. The control valve must continuously control the rate of flow of a fluid in accordance with the dictates of the controlling instrument. It must accomplish this by accurately positioning the inner valve through which the fluid must pass regardless of the dynamic reactions of the system to be overcome.

The two principal parts of a control valve are the valve body assembly and the operator. Each part must be properly applied in order to accomplish the ultimate result the complete assembly must obtain for product control.

Operators must be designed with sufficient power to fully stroke and maintain stability of the inner valve against the maximum unbalance forces on the valve as a result of the forces imposed upon the inner valve by the flowing material. Operators connecting stems, accessories, and all mechanical and structural parts must be capable of withstanding those forces which can be imposed by the operator.

The control valve body assem-

bly consists of three principal parts; the body, inner valve, and packing gland. Each part must be considered when specifying a control valve, from the physical properties of the fluid to be controlled.

The minimum number of types and ratings of body end connections should be specified to achieve maximum flexibility and reduce warehousing.

In general, control valves should be installed in the piping run with the by-pass valve above, making the manifold self-draining. The control valve should be located where it is readily accessible for maintenance, also at an elevation suitable for removal of the operator and/or the inner valve, without removing the valve body from the line if necessary.

Analyzers

The increasing growth of the process industries and the desire for greater efficiency and product purity require a direct monitoring of stream quality where indirect variables, such as temperature, pressure, flow, etc., are inadequate.

To meet this demand there are available to the systems engineer continuous inline plant stream analytical methods that must be applied and installed with a complete knowledge of the physical properties of the stream and in-

stallation techniques.

In each analytical application the specifications to the manufacturer should include a complete description of the stream composition, temperature and pressure, etc. It must be kept in mind that the manufacturers of analytical equipment are very progressive and they are continuously improving current equipment, as well as developing new devices.

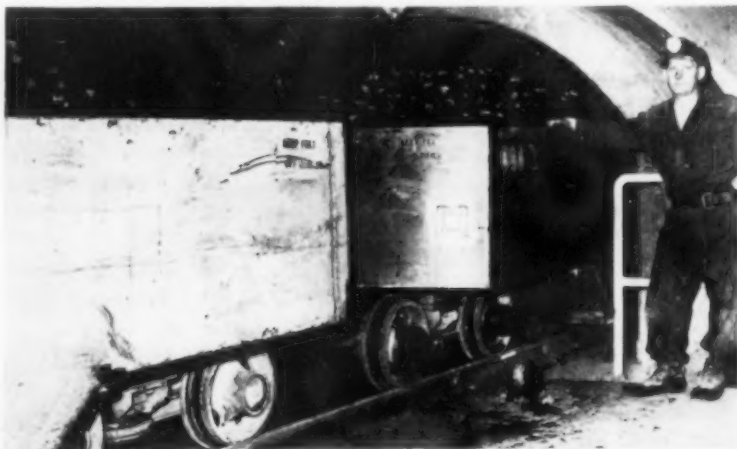
Although an analyzer can be defined as a primary element, it most certainly cannot be put into the same class as a thermocouple, flow or pressure instrument. To obtain maximum, continuous analyzer performance, the service men must have adequate training.

In conclusion, it has been seen that to achieve greatest economic advantage of process instrumentation factors other than performance offers a great challenge to the design engineer. He must eliminate trouble spots by the correct selection and installation of equipment.

Specifications, design data, and/or diagrams must be clear and concise so the manufacturers can furnish the desired material required without misunderstanding; and also, so that all others interested can, with ease, interpret his intentions for each application, leaving nothing to be desired in so far as operation of a system is concerned.

ALUMINUM MINE CARS — During a year-and-a-half's service in a

West Virginia coal mine these aluminum mine cars showed no sign of corrosion and proved they could take rugged day-to-day use. Made by Watt Car and Wheel Company, Barnesville, Ohio, the cars were designed by Reynolds Metals Company's development department.





Steel and masonry are combined here for an attractive plant. This Armco Building has 100-foot clear span width.

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How To Clean Coolers On Stream

By JOHN M. GRIFFITH

Mechanical Engineer, Maintenance Engineering Div.
Continental Oil Company, Ponca City, Oklahoma



INDUSTRY is ever searching for ways to increase stream time of its operating units. Fouling of equipment is one of the troublemakers in this effort.

Thanks to chemical cleaning techniques, fouled coolers and condensers that limit operation are no longer the problem they once were at Continental Oil Company's Ponca City, Oklahoma, Refinery.

Cleaning coolers while they are operating is done on a regular basis to maintain efficiency. Acid is injected into the cooling water stream. On stream cleaning by this method has so far been limited to the removal of water scale and oil film from the tube side of coolers and condensers.

There are several things to be considered before attempting on stream cleaning. These things are water flow rate, effect of the acid on cooling water, temperature on the shell side, size of the exchanger, and the presence of a suitable inlet for the acid between the exchanger and the water inlet valve.

Of the above items, the temperature and to a certain extent the water flow rate are the limiting factors. If the skin temperature is much above 200 F, there is danger of acid corrosion. If the flow rate is too great, it might be difficult to inject the acid fast enough. A certain minimum acid strength is necessary to remove the scale in the very short contact time allowed.

The acids used at Ponca City have been inhibited sulfamic acid and inhibited hydrochloric acid. The sulfamic acid did not perform

as well as the inhibited hydrochloric acid in on stream cleaning applications.

The choice of the inhibitor is *very important* because good protection must be provided at 200 F and even on up to 212 F. We have selected an inhibitor for hydrochloric acid after an extensive inhibitor testing program which consisted of running laboratory corrosion tests under a number of different conditions and with various alloys.

The choice of the volume of acid required depends upon the size of the condensers or coolers and how they are connected. No concrete rule can be laid down because acid requirements and injection rates are determined by experience with each particular unit.

As a starting place, we usually use twice as much acid as the volume of the tube side of the exchanger. The acid can be used full strength, i.e., 32 per cent HCl, or diluted to the level that experience dictates. At present, we have been using 32 per cent HCl diluted 50:50 with water in most of our on stream cleaning operations.

The best procedure to follow if the water inlet can be closed for a minute or so without affecting operations is to fill the exchanger with acid and allow it to remain for 1-2 minutes. The water inlet is then opened for 10-15 minutes before the operation is repeated. Although the scale cannot be entirely dissolved in 2 minutes, it is loosened and softened so that the cooling water removes a lot of the scale.

If operations will not permit the cooling water inlet valve to be closed at all, it should be pinched down as far as possible and the acid injected. In any event, the procedure used must be worked out for each individual case.

In on stream cleaning in the manner described, we have always been successful in dropping the temperature. The temperature drop obtained usually runs between 20 and 30 degrees F. The minimum temperature drop has been 5 degrees, and the maximum has been 80 degrees F.

There is one major drawback to this type of cleaning and that is, if the tubes are in poor condition, acid washing might cause a leak. Leaks are caused not so much from corrosion but from removal of scale and plugs from pinholes already in the tubes. If the tubes are in good condition, the chances of causing a leak are almost nonexistent.

One always takes a calculated risk when on stream cleaning, but in most cases it is a matter of shutting down anyway to clean the exchanger.

Another disadvantage of on stream cleaning is the effect on the cooling water. In large recirculating cooling systems, no great trouble is caused by on stream cleaning; but in small systems the effect on pH and treating chemicals must be considered. In some cases when an on stream cleaning job is planned, the sulfuric acid (used to control pH) can be discontinued several hours before performing the job.

On stream cleaning as it is be-

ing employed by Continental at Ponca City has had several beneficial effects besides preventing shutdowns. We have found that, at the end of a scheduled run, the coolers and condensers are much cleaner. In the past, tubes had become plugged with water scale, whereas on stream cleaning prevents or reduces tube plugging.

Because accumulations of water scale are prevented or reduced, concentration cell corrosion is minimized. Process side corrosion is also decreased because the skin temperature of the tubes is reduced. The maintenance of clean surfaces increases overall throughput because exchanger duty is increased.

Steam Return Line Suggestions

INDUSTRIAL plants having maintenance problems with steam return lines may find the following suggestions helpful:

(1) The feedwater deaerator should be operated at or near 212 F, and should be maintained in an efficient condition.

(2) All joints in return lines operating under sub-atmosphere pressures should be made airtight.

(3) All horizontal return lines should be given sufficient slope or pitch to permit rapid and complete drainage.

(4) All low points or pockets in the lines where condensate can collect should be eliminated or properly trapped.

(5) Reaming of pipe ends to remove burrs is particularly important in condensate lines.

(6) Cold water injection into return lines ahead of vacuum pumps should be avoided wherever possible.

(7) Extra heavy nipples should be used in return lines.

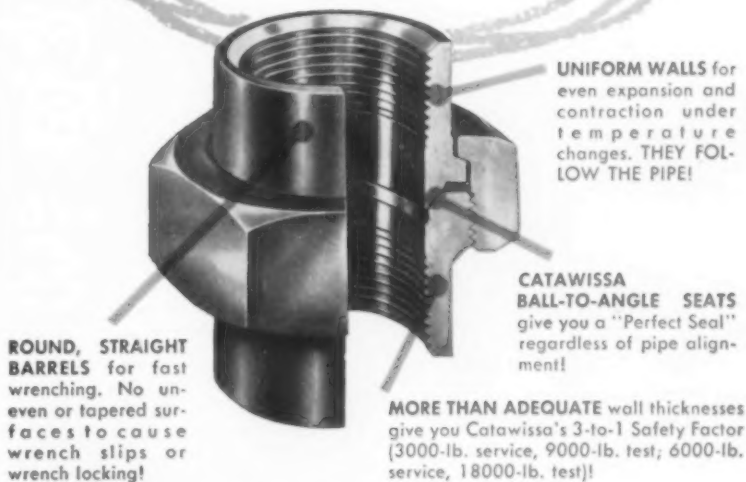
(8) Wrought iron pipe has helped to solve many heating corrosive problems.

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Insulate Flue Gas Ducts to Prevent Corrosion

STEEL FLUE ducts outdoors are exposed to cold air and rain. If the ducts are not insulated, the flue gas inside condenses on the cooling metal duct. This condensate corrodes the steel rapidly. But good insulation on the duct keeps the duct and gas warm enough to prevent flue gas condensation.

The ducts to the chimneys at Georgia Power Co.'s Plant Yates were replaced in 1959. The old ducts were rusty on the outside and corroded on the inside.

The new ducts were insulated with 2" thick mineral wool board. The ducts were first enclosed with No. 6 road mesh (steel) welded to the outer edges of the stiffening angle ribs. Enclosing the ribs in this manner eliminates the expense of covering the sides of the ribs.

The 2' x 4' sheets of insulation were secured to the road mesh by attaching specially-designed clips to the mesh. The insulation was then impaled on the clip and secured by means of a special washer. The insulation is semi-rigid, yet firm. It adjusts to slight irregularities in the steel and gives a smooth base for the aluminum jacket.

The aluminum protection jacket for the insulation is .032" thick and was supplied 36" wide. The edge joints are 3" standing ribs on top and 2" standing ribs for sides and bottom. Special equipment was used for flanging edges of sheets to cover the tops.

All of the top sheets are in one piece (no end joints) and some of them are as much as 30' long. The sheets are secured with clips which go through the insulation and are hooked over the large wire in the road mesh. Wherever metal overlaps metal the sheets are lapped so they shed rainwater.

A competent sheet metal fore-

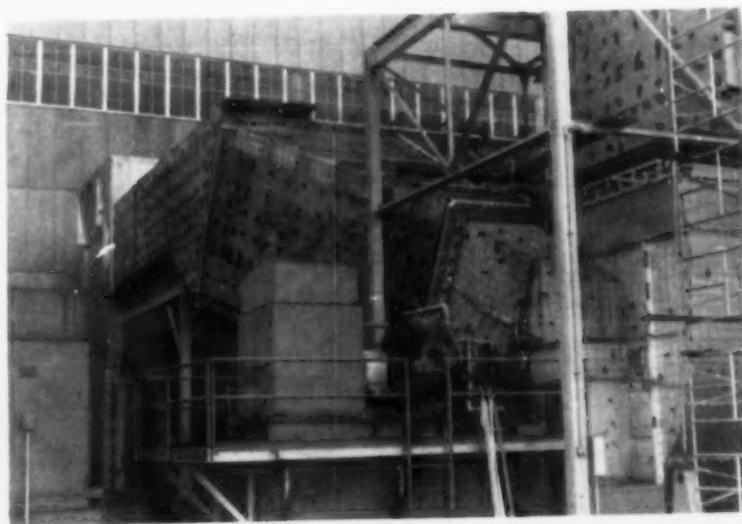
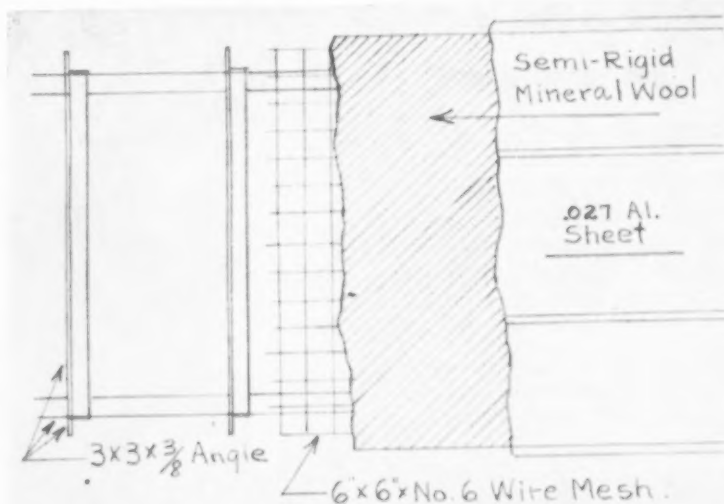
man is a must on such work. There are special job conditions due to obstructions and metal attachments which pierce the metal jacket and insulation; and it is not practical to cover all of these job conditions in the specifications, so the foreman must be both capable and conscientious.

In a few rare cases it is necessary to use a good non-hardening mastic to waterproof cracks. The mastic used at Yates was Seal Kote made by Lion Oil Division of Monsanto. The mastic is reinforced with fiberglass waterproofing membrane to help it bridge the cracks.

The metal is installed so that the maintenance department needs to check it only on a quarterly or semi-annual basis. Excessive water is not likely to damage the insulation, but it would accelerate the rusting of the duct.

Careful analysis of this job leads to the belief that the entire insulation system should outlast the steel duct and the insulated duct should last many years longer than the previous installation, and with much less maintenance.

By: SAM L. NORTH
North Brothers, Inc.
Atlanta, Georgia



The sketch above and photograph below show some of the details of application of duct insulation at Georgia Power Company's Plant Yates.

Couplings Solve

Shock Load Problem

THE MAINTENANCE superintendent at a modern pulp plant in Tennessee encountered frequent mechanical trouble arising from the shock loads generated at the time of starting centrifugal pumps handling a mixture of stock and water.

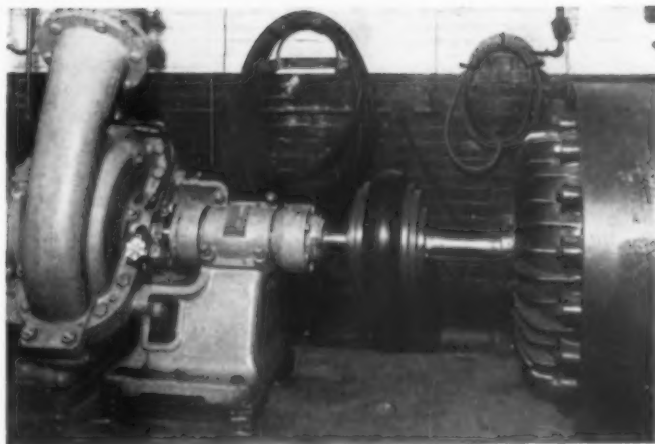
On this 14 x 20 pump, for example, the 200 hp, 1200 rpm electric motor must overcome the resistance of a 100-foot head. The shaft coupling previously used required considerable maintenance. By replacing it with a Para-flex Flexible Cushion Coupling, recently developed by Dodge Manufacturing Corporation, this trouble has been eliminated. The rubber-tire-like flexing element absorbs shock from motor, pump and receiving lines and requires no main-

tenance or lubrication.

As a result, this pulp plant has standardized on Para-flex couplings. The "four-way flex" of this coupling automatically compensates for end-float, parallel misalignment, angular misalignment or any combination of all three. Besides cushioning shock loads, it absorbs torsional vibration, reduc-

ing noise and protecting machinery.

The new coupling requires a minimum of space on the shaft. Its flanges are mounted quickly and securely with Taper-Lock bushings. When the flexing member needs to be replaced, this can be done without moving either the driver or the driven machine.



Sewer Problem Solved at Brunswick Gypsum Plant

AT THE NEW GYPSUM plant of Bestwall Gypsum

Company at Brunswick Georgia, a 3,200-foot combined sanitary and storm sewer was part of the construction project. Complicating the usual problems were soil of a tideland area, a high water table, and salt water from the adjacent Atlantic Ocean. The consulting engineers chose Armeo asbestos-bonded pipe for the sewer.

The consulting engineers, Johnson & Johnson, Inc., said that the reasons for selection of this pipe for the installation were: excellent corrosion resistance qualities in the tidelands and salt water conditions that exist in this location; relatively light weight and long lengths that make it suitable for installation in a soil where settlement is considerable as in this location; use of positive connections, thus reducing the problem of the lines pulling apart if settlement occurs; also the pipe was economical to use.

The new Bestwall Gypsum Company plant will manufacture products from gypsum brought in by ocean-going ships. The plant, some 1,260 feet long, will have the major portion of the sewer on the two sides of the building.

The pipe also has a paved-invert plus a double full-coating of asphalt, and was supplied in diameters ranging from 8 to 30 inches. Mechanical contractors on the project were James E. Smith & Sons, Inc.



Worker Comfort Part of Maintenance

By R. V. WILK, Plant Superintendent

Day-Bright Lighting, Inc.,
St. Louis, Missouri

MAINTENANCE is a broad term with many different meanings. Preventive maintenance is most to be desired. Of course, the everyday type of maintenance must be provided and must be available every minute of the day. However, the better the preventive maintenance program, the smaller the daily upkeep will be, which results in less down time and better production records.

I recently read of one company which is using the award system for new ideas on maintenance. This sounds like a good thing, for it provokes thinking on the part of all or at least many of the employees.

Better maintenance can sometimes be realized by relocating the equipment — perhaps by making a different type of installation. Here again, perhaps an operator may give just the idea that you have long since needed if he is consulted or encouraged to "speak up."

After all, good maintenance is very vital to each and every employee, from a safety standpoint if for no better reason. Someone has aptly named the Maintenance Department the "Profit Makers." This can be proven in any well balanced Maintenance Department. Let us review three important requirements in almost any factory — that of good lighting, heating and cooling.

LIGHTING — Different companies use different methods of maintaining high light efficiency. It is a universally accepted fact that high light output means higher production per man-hour, which of course gives a decrease in unit cost.

Recognizing this, some companies adopt a system of using lighting inspectors in each department to check daily for burned out

lamps or any other cause of faulty lighting. If lamps are burned out, they are replaced by these inspectors at the time. If it is a burned out ballast, a broken socket, a short or whatever, a color sticker is used to designate the fault and a repair or replacement is made by an electrician on a later shift.

In this way the daily production schedule is not affected. Some companies use the maintenance men on later shifts to clean the lamps periodically. Other companies use the method of a complete plant cleaning at inventory time or at midsummer vacation time. In either case, production is seldom hampered.

HEATING — Comfort to any employee is of prime importance. Needless to say if all employees are comfortable in their work, labor relations are better. A warm plant in winter, with temperatures the same in all departments is essential, though in many cases difficult to provide.

Some departments have outside doors used as receiving doors or others through which material is transported back and forth. In either case a problem exists, avoiding heat loss when doors are opened and closed frequently. Also, this same heat loss in these departments may cause drafts in adjoining departments, if doors between departments are left open or are opened and closed frequently.

We have controlled our heat loss by using automatic door closers both on outside and inside doors. These are operated by low-voltage push-buttons which we suspend from the ceiling or place on the wall, close enough to the door on either side so that power truck operators may reach them without dismounting from their motor

and without losing too much time. These buttons, of course, are placed so that employees in transit or pulling hand trucks may also reach them without undue exertion. Much heat is saved from the quick opening and closing of outside doors in this manner.


COOLING — Many or perhaps most of the new factories and shops now being constructed are air conditioned at the time of construction. Many companies are adding air conditioning to their present buildings constructed some time ago. However, if air conditioning is not in the plans for financial or other reasons, then care and thought should be given to the best cooling arrangement your shop can accommodate.

Electric fans, of course, are the "old reliable." If they are used, they should be suspended and guarded if at all possible. If pedestal fans are used they must be guarded front and back with fool-proof guards to prevent any kind of injury to the employee.

In addition to electric fans, quite often a shop may have so-called natural resources that can be put to use. For example, a shop having a department such as painting or plating, which must by its nature have a vast amount of air exhausted from the building, provides a natural draft from other departments in the same building. Try to utilize this natural draft in and through the departments during the warm weather, and place and regulate the electric fans to support the action of the exhaust fans by directing the air-flow where most needed.

There will always be some differences of opinion among the employees as to cooling, but usually a company engineer can accommodate most of them with the proper location of fans and proper air circulation. Good working conditions for employees in warm weather are as essential to them as in the cool weather.

In conclusion, let me make this observation. A training program in the maintenance department is desirable, especially in a growing concern. Let us place the high value of importance on a good maintenance department that it so justly deserves.



Ljungstrom rotor being installed for Southern California Edison plant at Huntington Beach, Cal. Eight such Ljungstroms will serve four boilers at this station.

AIR PREHEATER SERVICE WILL STILL BE IN EFFECT ON THESE UNITS IN THE YEAR 2000

These new Ljungstrom® Air Preheaters, being installed at Southern California Edison's Huntington Beach Station, will be protected by an unusual service policy, one that guarantees regular inspection by Air Preheater engineers throughout the life of each unit.

There's no terminal date on this service — it's in effect as long as the units are in operation. In fact, Lifetime Air Preheater Service is still helping to keep the first Ljungstrom installation in the U.S. running per-

fectly, although it's been in operation almost 40 years.

Air Preheater provides first-rate factory service too. In one instance, in response to a last-minute decision to replace cold-end elements near the end of a scheduled shutdown, Air Preheater fabricated and shipped over 13,000 pounds of heating elements the day after the order was received.

Regular inspection and fast factory service are just two of the advantages Air Preheater offers its customers. Another is expert knowledge of boiler

and preheater problems, gained through 35 years' experience. This combination — knowledge of customer problems and a *continuing* interest in them — probably explains why nine out of ten preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

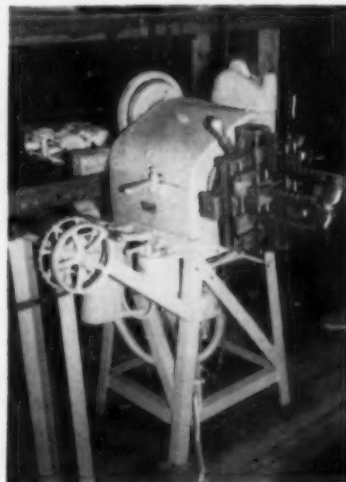
PERPETUAL RECORD OF EQUIPMENT					DEPRECIATION RECORD				
DESCRIPTION		Winding Coil Winder		CLASS	Equipment				
Age When Acquired	New	Estimated Life	20	Estimated Exchange Value		Estimated Annual Depr. Rate 5 %			
Date	COST			AMOUNT		Year	Rate	AMOUNT	Total To Date
Purchased	Detailed Description and From Whom Purchased			Dollars	Cts.				
1936	1 Coil Winder, Type B, Serial #124, with 4 speed, 220 Volt motor, and Browning Coil Equipment.			\$400	00	1936	5	18 75	18 75
	1 Type J Winding Head, with attachments.			290	00	1937	5	37 50	56 25
	1 Loop Winder made in our shop.			60	00	1938	5	37 50	93 75
				\$750	00	1939	5	37 50	131 25
	Purchased From:					1940	5	37 50	168 75
	Potter & Rayfield					1941	5	37 50	206 25
	Atlanta, Ga.					1942	5	37 50	243 75
	June 1, 1936					1943	5	37 50	281 25
						1944	5	37 50	318 75
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						1946	5	37 50	393 75
						1947	5	37 50	431 25
						1948	5	37 50	468 75
						1949	5	37 50	506 25
						1950	5	37 50	543 75
						1951	5	37 50	581 25
						1952	5	37 50	618 75
						1953	5	37 50	656 25
						1954	5	37 50	693 75
						1955	5	37 50	731 25
						1956	5	37 50	750 00
Sold, Exchanged or Discarded									
Date	EXPLANATION		Amount Realized	Less Than / Bk. More Than / Val.	Debit Reserve				

The illustrations above and at right show our simplified method of keeping equipment records straight. A photograph of the equipment is attached to the record card for each piece of equipment.

Photograph Accompanies Permanent Equipment Record

By R. W. WILSON

Wilson Electric Co., Inc.
Macon, Georgia



THE MAINTENANCE of equipment records to provide and justify depreciation charges on our shop equipment had been a problem with us for some time.

This problem was caused by:

1—Office personnel not being familiar with shop equipment.

2—Use of outside auditing firms who were not familiar with our shop equipment.

3—Shop personnel being unable to identify shop equipment, as de-

scribed in the written description on the equipment records.

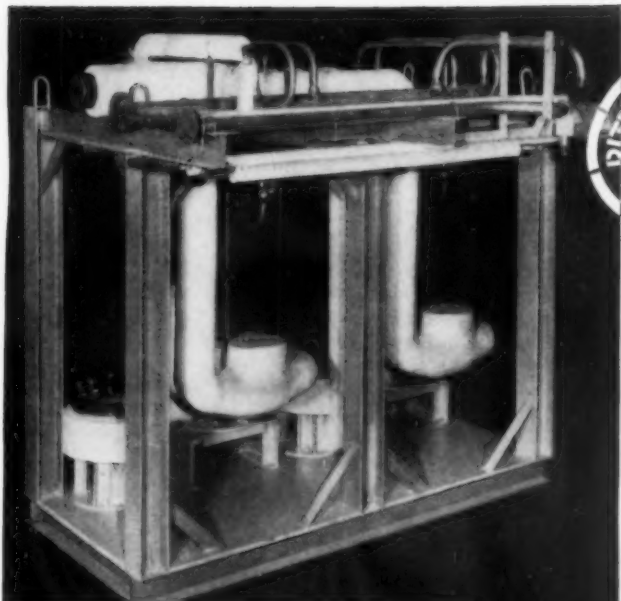
4—Shop personnel modifying capitalized equipment, and failing to turn in written reports on cost.

We have purchased a Polaroid camera for use by our sales department in quoting rebuilt equipment. It was decided to use this camera to take a picture of each piece of company equipment carried on our records. These pictures have been attached to the appli-

cable equipment cards for reference.

Since doing this, we have had no trouble, whatsoever, keeping our equipment records straight. The job of verifying equipment records has been reduced from one requiring management, office, and shop personnel time, to a job that can be correctly handled by a stockroom or office clerk.

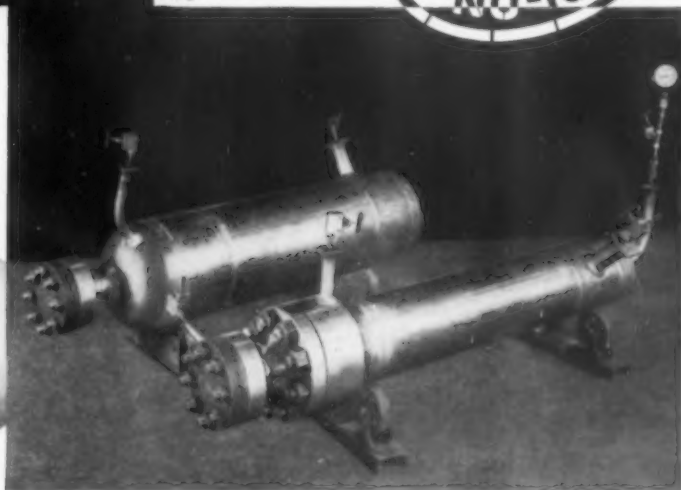
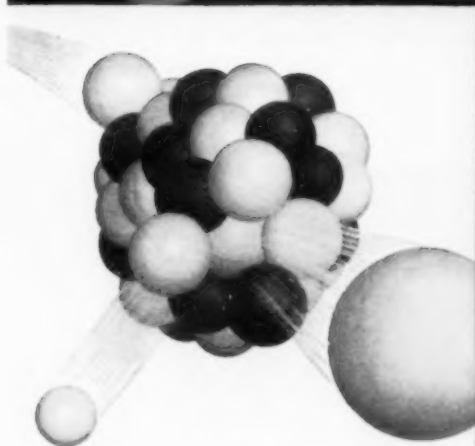
Identification is positive and sure.



One of a battery of stainless steel test loops fabricated at Pittsburgh Piping. Shown insulated; ready for shipment.



Stainless steel de-mineralizers—larger unit is 14" in diameter; its wall thickness is 1½".



PP-39

Fabricated by Pittsburgh Piping for Nucleonics

The stainless steel test loop and the de-mineralizers shown above are typical of the nucleonic piping work that goes through Pittsburgh Piping shops.

This type of fabrication is a "natural" for us. We pioneered the application of austenitic steel piping materials for central stations

operating at 1050°F and above, and fabricated piping for America's first atomic-powered submarine and central station. Today we are producing a wide variety of piping components for leading builders of nuclear energy installations. We invite you to inspect our plant, meet our people, and use our facilities on your nucleonic jobs.

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Daily Maintenance Planning

WE DO NOT FEEL that this is the

Utopia in planning, but it is serving us at this time. First we have a labor wall board which shows the craft and number of men available for planned work on the side of board. At the top of board we have listed plants and divisions.

Each area maintenance supervisor receives from each area production supervisor their needs in a work order form prior to 11 A.M. each Monday through Friday. The area supervisors attend a meeting in the conference room at 11 A.M. The maintenance superintendent also attends and acts as referee to decide who has priority with manpower.

Supervisor from "A" area will read his work orders and request the crafts and number of men needed for that work. This is numbered in the column under his plant or area. When supervisor of "A" area has completed his request, then other area supervisors make their request. If and when there is not enough manpower, we decide who shall relinquish previous requests. In this manner the most important jobs get attention.

When all jobs have been listed a clerk takes these and types them on a "must sheet." This sheet is so named because these jobs require attention the next day. A copy of this must sheet is placed on each foreman's desk, from which he makes up his work sheet.

The foreman has a back log of work orders and if the must sheet does not require all his manpower, he completes his daily planning sheet by using the back log of work. This sheet is submitted to a clerk who has carbon form sheets which are titled "Foreman's Daily Planning Sheet."

The clerk types this sheet for each foreman, sending the foreman (1) copy and making a composite of all crafts sheets for area supervisor, production supervisor and other interested people.

The following morning each foreman marks up his must sheet from previous day, prior to 11 A.M. He marks jobs completed or

percentage of completion, some of which is estimated, and also gives the number of men available for the next day's work.

The clerk receives this and marks up (1) composite sheet for the maintenance superintendent to use in planning meeting. The clerk revises the manpower available column on board prior to planning meeting.

We use assigned area maintenance men that do take care of emergencies that are not beyond their scope. Area maintenance supervisor meets with other supervisors for a few moments prior to work time each morning to see if there are any changes that must be made. We assign approximately 110 men in this manner each day.

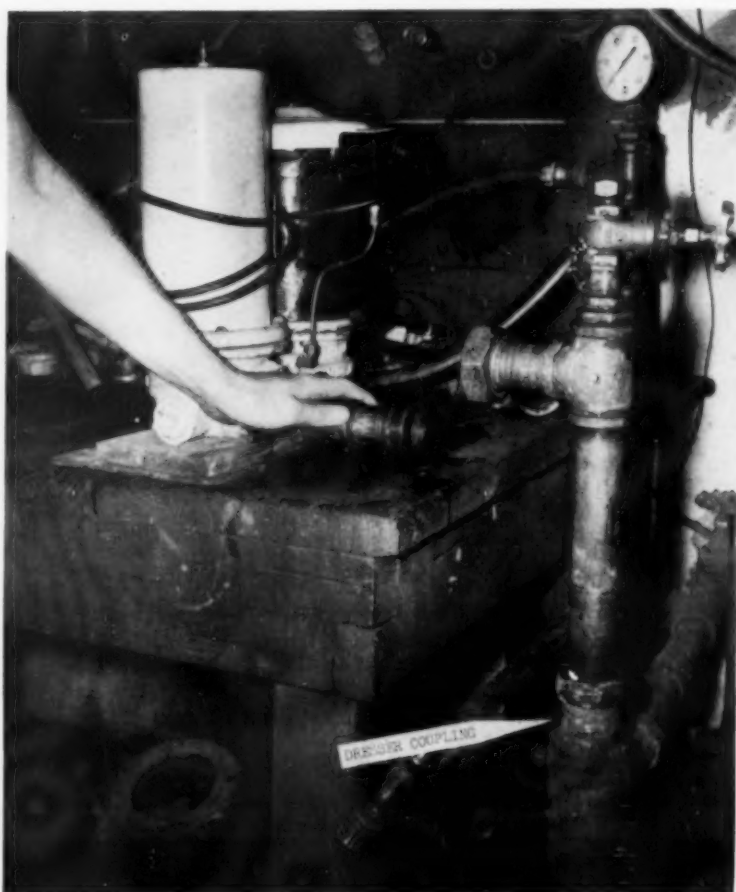
By H. C. DEMING, Maintenance Supervisor, Copolymer Rubber & Chemical Corp., Baton Rouge, La.

Dresser Coupling Aids Testing

WE KEEP in repair in our shop a host of water pumps of every size and construction, and it is a continuing problem to keep on hand enough of a variety of pipe fittings and nipples in order to hook up the repaired units for test before restoring them to their tasks.

For this reason, we've hooked up a dresser coupling in the vertical water supply line. By loosening this coupling, the feed pipe may be raised or lowered so its outlet lines up with the inlet to the pump. This avoids Rube Goldberg nipple-fitting hook-ups.

By HENRY JOSEPHS, Sarasota, Florida

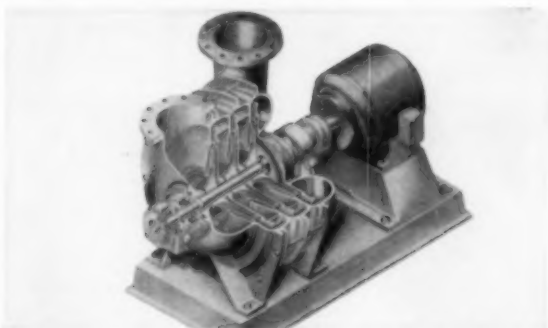


U.S. HOFFMAN MACHINERY CORP.

AIR APPLIANCE DIVISION

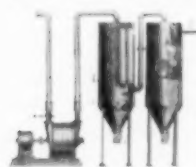
103 Fourth Ave., New York 3, N. Y.

Designers and manufacturers of multistage centrifugal air and gas blowers/exhausters—portable and stationary industrial vacuum cleaning systems — pneumatic conveying equipment — dust collectors — Smooth-Flow tubing and fittings — continuous metal, rubber and plastic strip/sheet dryers — steam and gas operated air heaters — valves and accessories.



MULTISTAGE CENTRIFUGAL BLOWERS & EXHAUSTERS

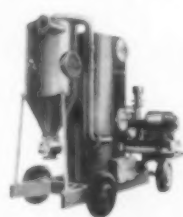
Rugged cast iron Hoffman blowers deliver clean dry air or gas in continuous duty applications such as combustion, agitation, drying, vacuum cleaning, sewage and waste treatment, pneumatic conveying, air squeegee, ore flotation, circulation of liquids, asphalt blowing, etc. Pressures to 10 psig, vacuums to 12" hg, and volumes to 20,000 cfm. Outboard mounted bearings. One piece cast aluminum impellers. Dynamically balanced rotors. No internal wearing parts. Vibration free operation. Constant pressure or vacuum throughout capacity range. Suitable for direct drive by motor, turbine or engine. Common steel baseplate.



STATIONARY VACUUM CLEANING SYSTEMS

Permanently installed stationary vacuum systems ranging from 3 hp to 100 hp permit cleaning operations throughout the plant with collection at a central location.

These systems will help prevent product contamination, insure better housekeeping, salvage valuable materials, eliminate manual handling and disposal. Heavy duty dust separators receive material and large filter cloth areas insure thorough separation. Suction hoses are inserted into strategically located inlet valves in piping system.



PNEUMATIC CONVEYING EQUIPMENT

Hoffco-Veyor pneumatic systems keep dry, powdery and granular materials on the flow. Permanent installations transfer a variety of materials including chemical powders, starch, plastic pellets, pharmaceuticals, etc., from one point to another in the production process. Rugged portable

Hoffco-Veyors such as this trailer mounted unit, can be used to handle catalyst, clay, sand, etc., in refineries, brick plants and chemical installations.

PORTABLE VACUUM CLEANING UNITS

Maximum efficiency in industrial housekeeping can be achieved with Hoffman heavy duty portable vacuum cleaners which range from 1½ hp through 15 hp. Mobility and flexibility enables the operator to do an efficient and thorough job of vacuum cleaning anywhere in the plant. Typical of the Hoffman portable units is the 7½ hp Hoffco-Vac 75 developing 7.8" hg suction and capable of operating two hose lines simultaneously. Filtering area 48 sq. ft. Removable dust bucket with capacity of 7.5 cu. ft.



MATERIAL INTAKE VALVE

Unique feeding valves permit the introduction of dry free flowing materials into vacuum conveying systems. Design incorporates offset air and material entry ports making it possible to regulate material flow and yet allow air to enter the line for purging. Separate air inlet protects connected equipment from full suction of the system. Constructed of cast iron, stainless steel or bronze. Valves can be modified for air cylinder operation.



PERISTALTIC VALVE

Rubber diaphragm valve utilizes peristaltic action to discharge materials in controlled quantities. Designed to handle the type of product which can not be successfully passed through a rotary feeder. Alternate opening and closing of sheet rubber diaphragms facilitate passage of coarse abrasives or odd shaped materials. Elliptical body section and sandwiching of diaphragms insures positive closure

against high differential pressures. Fail-safe feature provided in event of rupture of either diaphragm.



ROTARY DISCHARGE VALVE

These chain-driven air-locks of cast semi-steel construction discharge materials from pneumatic systems. Valves have torque limiting drive sprockets to protect against jamming and overloading. Equalizing connections

permit attachment of bleed lines to vacuum or pressure source. Inspection of interior can be made through access port without disassembling valve. Fabricated and cast multi-bladed rotors are designed for interchangeability. Standard horizontal shaft gear motors.

Write for illustrated catalogues. Our application engineers are available for a survey of your production and maintenance problems without obligation.

Water Well Corrosion and Protective Measures

By R. L. HALE, JR.

Inspection Department
Cit-Con Oil Corporation
Lake Charles, Louisiana

ALL FOUR of Cit-Con Oil Corporation's water wells were drilled and developed in the 500-foot sand. The well casings are 18" extending to the 500-foot sand, and equipped with approximately 100-feet of 10" stainless or stainless wrapped screen. The pumps are size 15", all bronze centrifugal pumps, 1500 gpm, set at approximately 200-ft below grade. The shaft operates in a 3" oil tubing which in turn is centered in a 10" water discharge pipe, by means of combination couplings and spiders with rubber bushings between the spider and the 3" oil tubing.

The water analysis is generally as follows:

Chlorides	32	ppm
Total Solids	335	ppm
Total Hardness	145	ppm
Calcium Hardness	104	ppm
Magnesium		
Hardness	41	ppm
"M" Alkalinity	170	ppm
Silica	22	ppm
pH	7.3	
Iron	1.3	ppm
Color	20	

Two of our water wells were put in service during the summer of 1949 and were not pulled for inspection until April 1951, a run of approximately two years. We were disappointed and rather surprised to find severe corrosion on the 10" water discharge pipe. This occurred at the couplings, in the threaded areas outside of the pipe. We also had pitting inside the pipe. The 3" oil tubing, in which the shaft revolves, was also deeply pitted in the area where it passes through the rubber bushed spider in each coupling.

The corrosive attack outside the pipe originated at the edges of the coupling and worked through the threads to the butt joint. Since there was no corrosion O.D., except in this area, we believed this to be a "concentration cell" or "crevice" type attack, caused when

a metal is exposed at two or more points on its surface to different concentrations of the same solution.

The pitting inside the 10" pipe in the coupling area and the pitting on the 3" tube inside of the rubber bushing were attributed to galvanic action, possibly due to different energy levels, stress, agitation, etc.

This corrosion was costly both in labor and downtime, since the oil tubing had to be renewed. The 10" water discharge pipe was cut and rethreaded and some new joints installed to maintain overall length. New couplings were also installed.

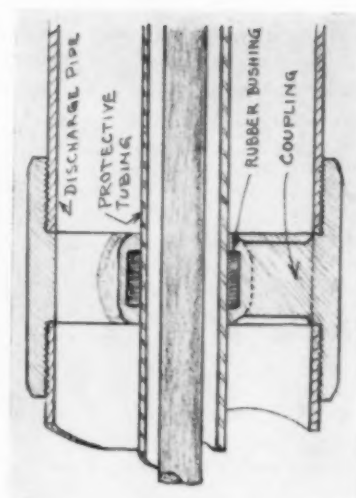
We have not experienced too much trouble with our pumps and shafting; usually only nominal repairs are necessary.

It seemed obvious to us that to stop the corrosion outside the 10" pipe at the coupling, the threaded areas would have to be sealed off. Since welding was not practical, we decided to treat the metal surfaces and use some kind of sealing compound over the complete joint.

We set up the following procedure which has completely eliminated the coupling and thread corrosion:

1. A phosphate wash primer is applied to pipe and coupling threads, after buffing to clean metal.
2. A coat of a chlorinated rubber base metallic lead primer is then applied to all threaded areas.
3. The threaded joints are then made up using a liberal application of a non-hardening pipe dope.
4. Before the pipe is lowered into the hole, a heavy coating of a viscous rubberized underseal is applied over the entire coupling and for six inches each side. This is brushed on and we have found it to be in good condition and still flexible after about three years' service.

Incidentally, we found by experiment that it was necessary to reduce the O.D. of the 10" pipe by machining in the area to be threaded from 10.750" (original) to 10.720". A standard straight



#8 thread is then cut. This compensates for the thickness of the coating applied and allows the joint to be made up without galling.

We decided to try cathodic protection to combat the internal corrosion. Magnesium anodes seemed to be the only feasible method. A stainless steel clamp was fabricated to suspend an anode from the spider in each coupling. A magnesium rod 1.315" in diameter, one foot long, was bolted to the clamp with stainless steel bolts. We were limited in size because we did not want to choke down the annular water discharge space between the 3" tubing and the 10" pipe any more than necessary.

The bolted end of the anode was coated numerous times with Glyptal, to keep the anode from sacrificing itself at the bolts and causing a loose connection.

A copper cable was run from the anode hanger and clamped to the 3" tubing. This allowed the current to flow from the anode through the water to both the 10" and the 3", with a direct connection back to the anode.

After a run of approximately three years, the pump was again pulled. It was found that the anodes had reached the end of useful service life. However, the 10" pipe was in excellent condition, inside and outside. The copper cables had

become detached from the 3" tube, breaking the circuit, and pitting was severe in the same area.

Just prior to this time, in the fall of 1954, a cathodic protection system was installed in our plant. We therefore removed the insulating gaskets, washers, sleeves, etc., in the discharge piping at the wells. This allowed any impressed current picked up in the wells to flow back to the negative side of the rectifiers.

We did not change the treatment given the 10" pipe joints. The anodes were reinstalled but this time we used a new type clamp fastened directly to the 3" tubing just above the spider bushing. This allowed current to flow from the anode to the 10" pipe and out of the well to the rectifiers. Thus, a separate circuit was set up at each bushing to protect the 3" tubing.

This installation has worked remarkably well, and we have found no corrosion of the 10" and 3" piping during later inspections.

Our last inspection, in January 1960, showed we were not getting enough protection with the Glyptal over the bolted area of the anode, so we are now using a waterproof, self-curing epoxy-resin in coating, which we believe will give better results.

Corrosion Resistant Conduit

RIGID VINYL PIPE is being widely used as electrical conduit to solve underground corrosion problems.

At the Sanford Station of Florida Power & Light Company, southeast of Daytona Beach, conduit is made of Geon vinyl, a product of B. F. Goodrich Chemical Company. This material has high strength and is resistant to salt water, gases and corrosive soil conditions. Since the smooth inner surface of the vinyl conduit will remain undamaged by corrosion, pulling new cable through them years from now will be just as easy as was the original installation. Lightweight and ease of installation are additional plus values to contractors.

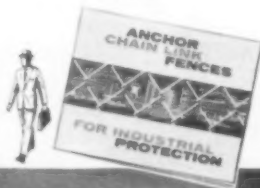


John Burrows, Plant Mgr., Ralston Purina, Davenport, Iowa, says:

"...Anchor Fence really solved our problems."

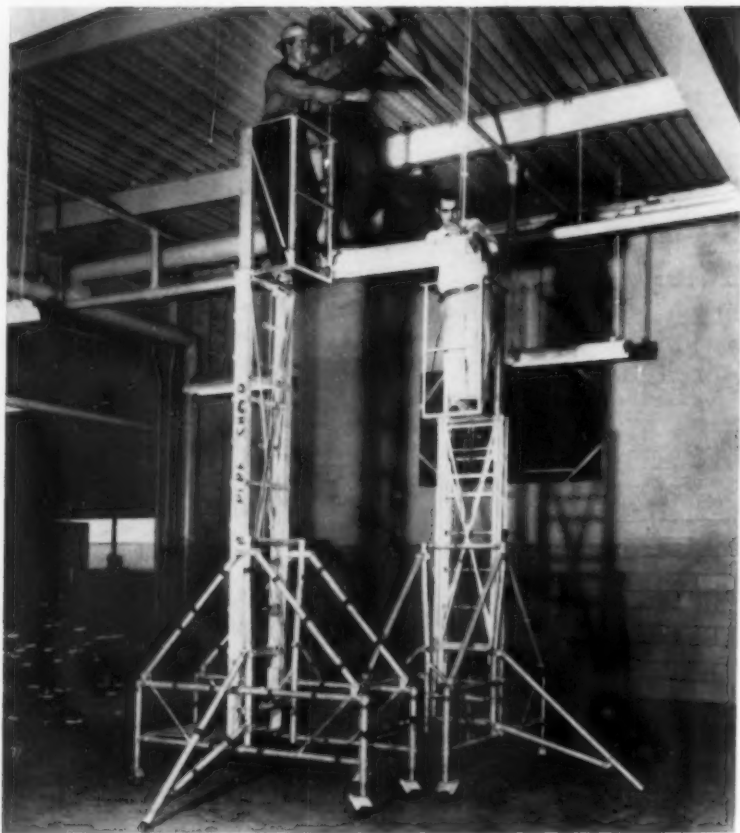
"Our plant area used to be what the legal profession calls an 'attractive nuisance.' Children and dogs had access to the grounds. And we had pilferage and traffic tangles to cope with too. The installation of Anchor Fence really solved our problems. Traffic now flows more smoothly, employee cars are protected, and of course the safety of children is no longer a headache. The Anchor men made numerous trips to the plant to be sure the job was tailor-made to our needs."

Call your local Anchor office today for a talk with one of Anchor's trained sales engineers. Write for free catalogue to: **ANCHOR FENCE, 6625 Eastern Ave., Baltimore 24, Maryland.**



Plants in Baltimore, Md.; Houston, Texas; and Whittier, Cal. • Sold direct from factory branches in principal cities.





North Carolina Plant Speeds Work with Scaffolds

TELESCOPING aluminum scaffolds on wheels that fold down to roll through doorways and are adjustable for reaching heights up to 31 feet facilitate construction of the new plant of R. J. Reynolds Tobacco Company near Winston-Salem, North Carolina.

Scaffolds are used for fastening motors to frame, conveyors to ceilings and for installing conduits, piping, ducts and supports for equipment.

Twenty-nine such units, known as Tallescope, are used by the R. J. Reynolds Company for overhead installations and maintenance. Lightweight and rapidly assembled by one man, each scaffold is only 29" wide for rolling through congested areas. They are manufactured by Up-Right Scaffolds.

Pint-Size Lathe in Big Plant

AS EVERYBODY KNOWS, when a piece of machinery breaks down it may mean that production and delivery schedules will go awry unless it can be put back in service in a hurry. The seasoned staff that runs the plant of Tube Turns, Louisville, Ky. — a division of National Cylinder Gas Company, Chicago — not only takes every reasonable precaution to avoid such unplanned downtime, but also keeps a large stock of parts on hand for emergency use and replacement needs. Moreover, the plant has the facilities and trained manpower to make most of those parts that may not be immediately available, should this be necessary.

Many large parts can be turned out in a well-equipped tool and die shop. Very small parts are produced in the instrument laboratory, which serves as our subject here. The lab is responsible for maintaining control instruments. Some of these controls, so

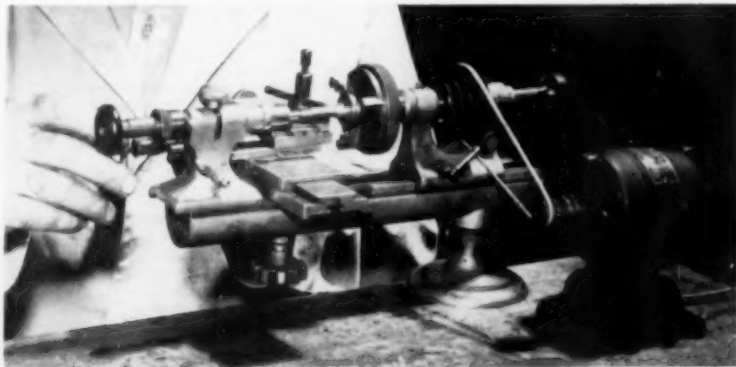
important in automation, are as intricate as a fine watch. Others are as simple as a kitchen clock.

One of the interesting tools employed by the lab in maintaining instruments is the pint-size jeweler's lathe shown in the accompanying photograph. It is used to make tiny parts that cannot otherwise

be obtained on short notice, as — for example — a gear shaft with a diameter of .0015".

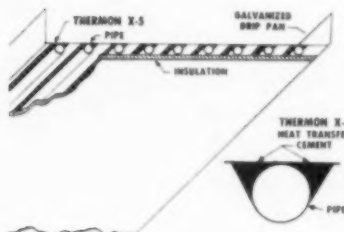
Most of the plant's instrumentation is standard. However, a considerable number of instruments are modified, or designed and built for the exclusive processes employed by Tube Turns, with the aid of this lathe and other special equipment.

Here, a lab technician makes a small part for an instrument used in Tube Turns' quality control program.



Defrosting Problems Solved

TO ELIMINATE defrosting problems on a 60-ton, 17,250 cfm air handling (quick-freeze) unit operating at an ambient temperature of 6 F and used to quick-freeze produce before transfer to a cold storage room, Natkin and Company, Mechanical Contractors, Houston, Texas, have installed Thermon X-5 Heat Transfer Cement for the Houston Central Warehouse Company.



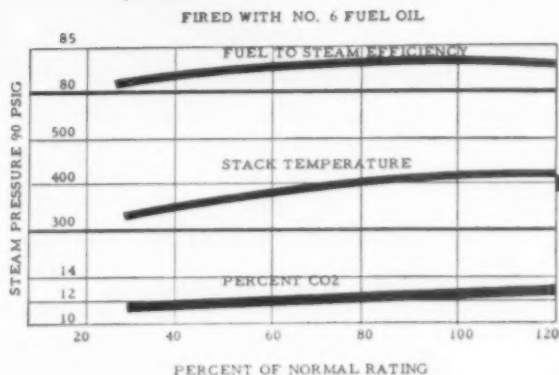
High pressure ammonia gas at 120 F is pumped from another unit to melt the ice which accumulates on the quick-freeze unit during the ten-hour cooling cycle. A drip pan equipped with 1" external pipe coils connected to the ammonia line catches the ice melted from the unit.

This arrangement, however, did not provide sufficient heat input to the pan. Water from the defrosted coils froze in the pan and plugged the drain lines. This heavy residue of ice had to be hosed off the pan with hot water, requiring some two to three man-hours per week. This procedure also presented a serious housekeeping problem because of spillage.

To eliminate this problem, Natkin and Company applied Thermon X-5 to the drip pan coils. This produced greatly improved heat transfer performance and completely eliminated the time-consuming manual portion of the defrosting operation. A possible alternate solution, installation of galvanized internal coils in the drip pan, would have been considerably more expensive. Thermon Heat Transfer Cement is produced by Thermon Manufacturing Company, Houston, Texas.

Continental

2-PASS DESIGN...



2-PASS AUTOMATIC BOILER GUARANTEES 80% EFFICIENCY ON EVERY FUEL

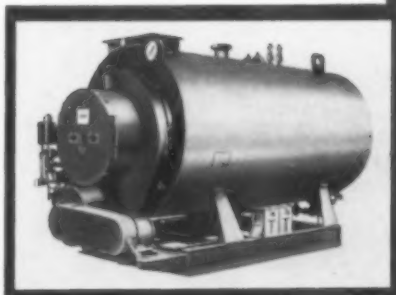
HIGH EFFICIENCY over its entire life is assured by Continental's 2-Pass construction. Continental boilers guarantee 80% minimum efficiency on every oil, gas or combination use of fuel.

SUSTAINED HIGH EFFICIENCY—The simplified Continental 2-Pass design assures brand-new performance for the life of the boiler. High CO₂ is produced, and low stack temperature is guaranteed not to exceed 125°F. above boiler water temperature.

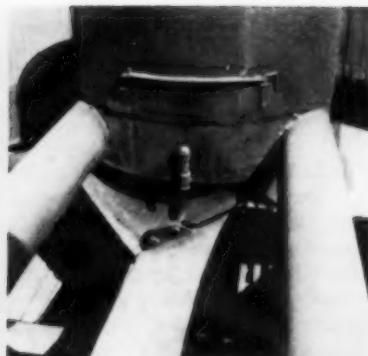
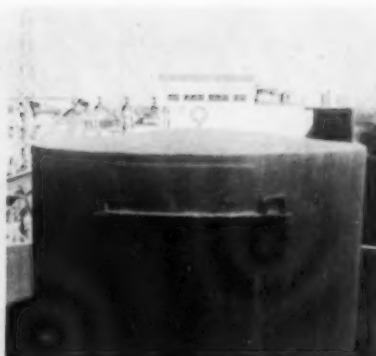
15 to 600 hp Steam Boilers — to 250 psi

Hot Water and HTW Boilers—Oil, Gas, Combination Oil/Gas

For complete data send for Bulletin BE-400



CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY CO., INC.
 Phoenixville, Pa.



View at left shows the motor housings and supports after weatherproofing. At center the housing has been finished with fiberglass. Bottom of repaired housing is seen at right.

Better Repair Procedure for Corroded Cooling Tower Metal

PROTECTING steel around a cooling tower has been a problem for many years. The fan supports and motor housing covers on our induced draft cooling tower required such protection. The method previously used to protect the metal was not satisfactory, since it would not withstand the constant cooling tower mist and weather which was causing the corrosion attack under the layers of materials previously applied. Consequently we developed the following procedure which, in all respects, has thus far proved satisfactory.

The project of cleaning the tars, grease and paint from the structures was the major job and consumed most of the time. In the process an electric scraper was used instead of sand blasting because the tower had to remain on the line. Also a burning torch was used to burn off the tars and coats of paint.

For the coating process our maintenance foreman suggested the use of rust inhibiting oil, red lead primer and Gilsomastic which was also approved by our system chemist. The wetting oil, as we call it, was applied after the cleaning to obtain a good bonding surface for the primer. After it dried the primer was applied, and then the finish product of Gilsomastic which was thinned down and

painted on with a regular paint brush.

During the cleaning operation large holes were found in the motor housing covers which soon would cause leaking and eventually motor troubles.

After much discussion with our plant manager, and others who had had some experience with fiberglass, it was decided to try the "glass" on these motor housing tops. Considering the low cost of materials and application and the versatility of fiberglass and the known water and weather protect-

ing characteristics, it was worth a try.

The application was successful. Replacing the tops with other metal would have consumed considerable time and money, whereas using a combination of laminating resin with catalyst over fiberglass proved inexpensive as well as time saving.

After having a repaired unit in service for approximately a year, the procedure is believed to be another step forward in fan motor housing and structure protection. All twelve fans were completed in January 1959 with the above materials and application.

By **BOB McALISTER**,
Plant Chemist,
Roswell Power Plant,
Roswell, N. M.

Aluminum Cuts Maintenance

USE OF ALUMINUM in industrial construction and equipment climbed to 1.1 billion pounds in 1959 and will move upward to over 1.3 billion pounds in 1960. New industrial applications of aluminum and growing realization of the savings aluminum offers in plant maintenance and operation account for last year's jump of about 30 per cent over the 1958 figure, according to a statement by W. T. Ingram, Reynolds Metals Co. general sales manager.

"In many cases aluminum-clad factory buildings are saving their owners up to 80 per cent in maintenance costs. And items like aluminum bus duct, silver-plated alu-

minum bus bar, electrical cable, conduit, piping, heat exchangers, insulation jacketing, ladders and scaffolds are helping him to achieve a better, more efficient operating pace."

Mr. Ingram said that probably the most significant recent aluminum development for industry is the new all-aluminum housing for outdoor switchgear, engineered jointly by Allis-Chalmers and Reynolds. This cost-cutting application heralds use of aluminum in scores of other applications for indoor and outdoor metal-clad switchgear, panel boards and motor control equipment, he added.

Through use of labor-saving de-



Aluminum conduit is being used in ever growing volume.

vices such as extrusions, aluminum switchgear housing can be manufactured at costs comparable to steel housings fabricated through normal methods. It offers low maintenance, corrosion resistance and attractive design possibilities. Its lightweight makes it extremely adaptable for rooftop installations and its heat-reflectivity increases operator comfort and efficiency in hot weather.

Mr. Ingram said that aluminum conduit, which accounted for less than one per cent of the total conduit market in 1958, today accounts for almost 10 per cent and that there is every indication it will make up 20 per cent of the market in 1960.

The rapid jump in demand for aluminum conduit stems from the fact that it is 20 to 40 per cent less expensive to install, requires fewer supports and reduces voltage drops because it is non-magnetic. It has a modern, clean-looking appearance that resists corrosion and never rusts.

He said many of the same advantages account for the increasing use of aluminum bus conductor and cable.

Generally, the lightweight and

Largest Merchant Iron Producer in U. S. Chooses

WHIRLEX ID FANS

**High Erosion Resistant
Fan Wheel Assures
Longer Life ...
Minimum Maintenance**

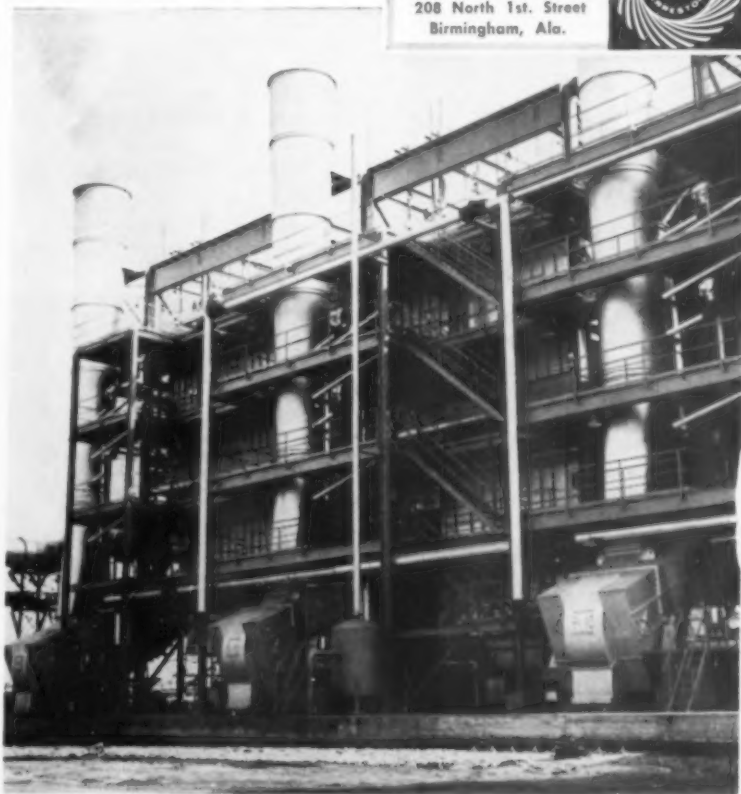
The largest furnace in the country producing merchant pig iron was recently placed in service as part of an expansion program by a major Southern mill. The new furnace has a rated capacity of 1000 tons per day and is one of the most modern in the country with respect to mechanization and automatic controls.

Because of their unique

design and high erosive resistance, WHIRLEX heavy duty induced draft fans were chosen to handle the hot blast furnace gas. The three units shown here carry approximately 150,000 cubic feet of gas per minute. Preliminary fan examinations show wear to be less than a third that of ordinary fans designed for this purpose.

*A Whirlex fan installation
may solve your problem.
Write or wire us.*

**Fly Ash
Arrestor Corp.**
208 North 1st. Street
Birmingham, Ala.



low-maintenance qualities of aluminum account for most of its uses in other plant operations, he said. Items of equipment such as aluminum scaffolds and ladders are easily portable and can be relocated with little effort. Lightweight moving parts on machinery are less cumbersome to motivate and

will not wear as heavily or need maintenance as frequently. Paint-up and replacement is cut to a minimum.

New types of aluminum piping — including heavy-end pipe and duplex pipe — are stepping up use of the light metal for this application.

Hoist Inspection Plan Cuts Production Down Time



Arrangements are made by factory representatives with either distributors of 'Budgit' hoists or Manning, Maxwell & Moore, Inc., field sales personnel to have a hoist inspection survey made. An inspection team of factory trained service representatives then comes in and makes a careful systematic inspection of the condition of each 'Budgit' Electric Hoist.

As shown in the photo, the inspection team makes "on the job"

hoist inspections, eliminating the necessity for removing hoist from its station which would interrupt production.

Hoists are checked for proper lubrication, oil level, chain wear, motor brake wear and adjustment, and the general condition of frame, upper and lower hooks, controller, and limit lever mechanism.

As each hoist is checked, findings are recorded on a special inspection report form along with hoist serial numbers and hoist locations.

At the conclusion of the survey, the completed inspection forms are given to the plant personnel responsible for maintenance, for their permanent record. Definite recommendations are made at that time as to what repairs, if any, are required to correct existing hoist irregularities. Where hoists show evidence of abuse or overloading, immediate replacement of stressed or damaged parts is emphasized. As the rule, owners take immediate corrective action to repair their hoists and put them in top operating condition.

No Stalling at Slow Speeds

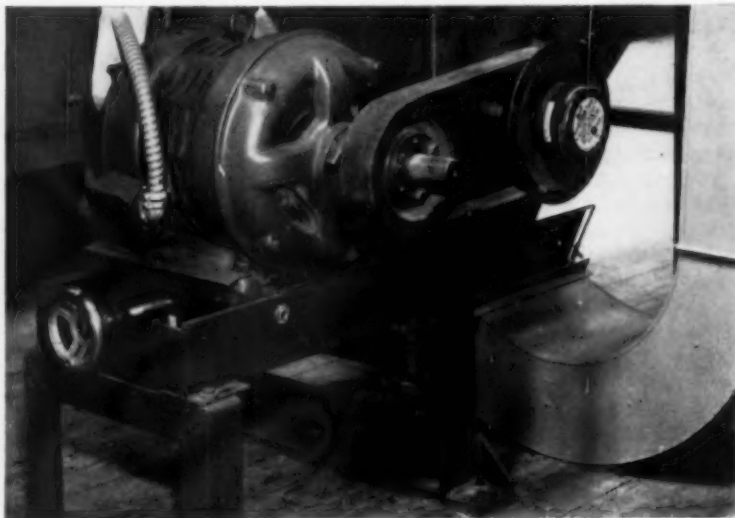
THE PROBLEM at Carrington & Michaux, Inc., processor of leaf tobacco, was to find a variable-speed drive that would not stall at slow speeds. The drive was needed for a large tobacco shredder, approximate capacity 6,000 pounds per hour, which operates 8 to 16 hours per day, seven

months a year, at the Richmond, Va., plant.

The shredder is driven by a 20-hp motor operated at 1800 rpm. Most of the belt drives tested failed to transmit the full capacity of the motor at the slower belt speeds. This would result in slippage and the production of frictional heat

A UNIQUE hoist inspection plan for owners of 'Budgit' Electric Hoists, having multiple hoist installations, is offered by the manufacturer, Manning, Maxwell & Moore, Inc. The plan consists of a no-charge inspection survey, by factory trained personnel, to determine condition of all hoists within the owner's plant, with survey results presented in chart form to encourage and assist in hoist maintenance.

Hoist owners who have made use of this plan have found it reduces maintenance costs, promotes safety for both equipment and worker, and cuts hoist downtime to a minimum. Here's how the plan works:



that damaged the belt.

The newly developed "MCS" drive of T. B. Wood's Sons Co., was recommended by Transmission Products Co., Inc., Richmond distributor. The grooved companion sheave was mounted on the motor and the variable-speed sheave on a countershaft. This method of mounting was made possible by the fact that both flanges of the variable-speed sheave are movable. The sheave has a minimum pitch diameter of 6 inches and a maximum pitch diameter of 12 inches. The sheave is designed to hold a constant driven speed during changing torque loads.

"The new drive maintains constant belt speed and transmits maximum belt capacity at slow speeds," reports W. W. Michaux, Jr., president of Carrington & Michaux.

With the variable-speed sheave used on this installation, cam pressure is exerted only when the load requires it. Power is transmitted equally to both movable flanges through a series of torsionally resilient rubber cam followers. The sidewall pressure on the belt varies in proportion to the torque required to carry the load. Since the grip on the belt increases as the load increases, the pitch diameter is maintained, and the driven speed kept constant.

A further advantage is the absence of fretting corrosion, freezing and sticking. The rubber cam followers are located between the sleeve caps and flanges, outside the bearing surfaces. There are no points of constant contact anywhere between the flanges and sleeves to obstruct lubrication. The resilient cam followers allow continuous rotational oil pumping action of the flange hubs on the sleeves. With each revolution of the sheave, the oil film on the bearing surfaces is constantly renewed and evenly distributed.

The drive has performed perfectly, comments Mr. Michaux. Its performance was proved when, under severe load, the heaters in the motor "kicked" the motor out; but the drive itself transmitted all the power that the motor could produce. With previous drives, the belt would burn up under the same conditions.

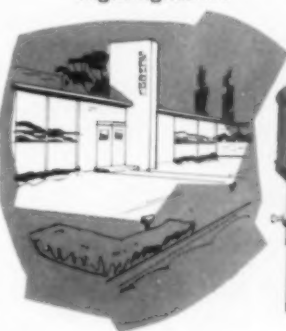
for service entrances



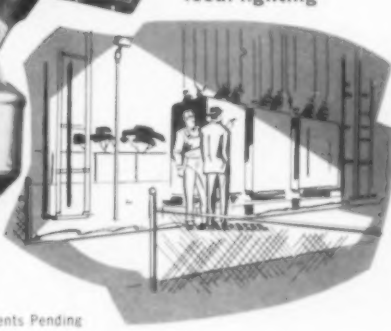
... loading docks



night lights ...



local lighting



Patents Pending

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The exclusive rectangular reflector of Wide-Lite Juniors gives the broad light pattern that's unique in the lighting industry! Frequently, one Wide-Lite takes the place of three regular floodlights. Wide-Lite Juniors with color-corrected mercury vapor lamps use 61% less power. And with 700% longer lamp life, you can depend on them to keep vital areas well lighted!

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At 250 watts, Wide-Lite Juniors with mercury vapor lamps have 10,500 lumen output as compared with 3,700 for incandescent lights ... at 100 watts, 3,300 lumen output as compared with 1,630 for incandescent lighting. And Wide-Lite's segmented, rectangular reflector gives a broad light pattern without "hot spots" or shadows!

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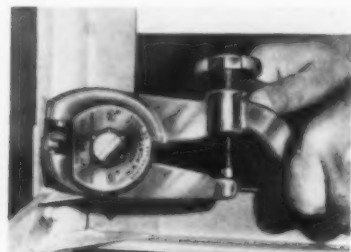


NEW PRODUCT Briefs

... there is always a **BETTER WAY**

Nut Splitter

Q-1 Stubborn "frozen" and rusty nuts can now be reached, split, and removed easily and quickly with the new HKP Swivel Jaw Nut Splitter in-

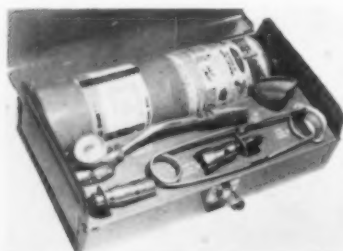


roduced by **H. K. Porter, Inc.**, 74 Foley Street, Somerville 43, Massachusetts. It is designed to cut nuts up to, and including, $\frac{7}{8}$ " across flats.

To operate, the swivel blade is placed against the side of the nut, the power screw is turned by hand until the jaw is tight against the nut, and then tightened with a hand or power wrench until enough pressure is applied to split the nut. The tool will not damage the bolt from which the nut is removed, and the whole procedure takes only a few seconds' time.

Utility Torches & Kits

Q-2 Propane fueled utility torches and torch kits are now available through the facilities of **Air Reduction Sales Company**, 150 E. 42nd St., New York 17, N. Y. Called the Bernz-O-Matic, this equipment can be used for soft soldering, paint burning, copper



tube sweating, and general applications requiring heat.

The torches feature instant starting, long burning, self-sealing valves, no hoses required, all-position burning, and disposable cylinders.

The torch is available in single cylinders with push-button to pencil-type tip assemblies, or in carry-all kits.

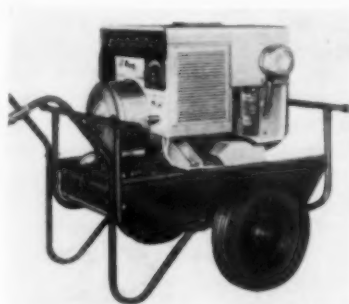
One-Piece Scaffold

Q-3 Manufactured by **Up-Right Scaffolds**, 1013 Pardee, Berkeley, California, and designed without loose braces, nuts or bolts, is a new one-piece scaffold



on wheels. Two folding V braces snap together and lock automatically to form a rigid X brace joint to support the structure.

Ten feet long and only 29" wide, the scaffold rolls through doorways and down narrow aisles. Platform height is adjustable from one foot to 8½ feet. Casters lock automatically; legs are instantly adjustable for uneven floors and stairways. Known as Up-Right V-X, this new scaffold is dimensionally interchangeable with standard Up-Right span type scaffolds.

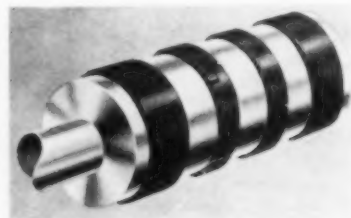


Portable D-C Welder

Q-4 **A. O. Smith Corporation**, Milwaukee, Wisc., has introduced an improved portable d-c welding machine, featuring a 2000 watt boost in a-c auxiliary power and optional electric starting. The new "Bug" welder comes equipped with a two-wheel dolly. The welder can be easily removed from the dolly for stationary operation.

Teflon Piston Rings

Q-5 Filled Teflon piston rings, offering all of the chemical and mechanical advantages of this fluorocarbon resin, are now being marketed by **The Garlock Packing Company**, Palmyra, New



York. The new piston rings are designed for non-lubricated service to seal reciprocating, oscillating and rotary motion of both external and internal cylindrical surfaces against the leakage of liquids or gases. Matched filled Teflon rider rings are also available for use in conjunction with the rings where long stroke or heavy pistons necessitate additional support.

Cleaning & Descaling Tool

Q-6 The Marindus Company, Inc., 51 Pine St., New York 5, N. Y., is marketing a new cleaning and de-scaling tool that de-scales and prepares surfaces by means of a set of reciprocating needles striking the surface being worked. It operates on normal air pressure, not more than 90 psi, and consumes a maximum of only 15 cfm.

The Von Arx Air Gun is also used to strip off paint, to clean weld seams and to scarify concrete and other surfaces using chisel-tip needles.



Epoxy Floor

Q-7 A new epoxy floor has been developed by the Kalman Floor Co., 110 E. 42nd St., New York.

The epoxy floor is resistant to most acids, alkalies and solvents. In addition, because it cures quickly and withstands abrasion, it can be used to resurface worn industrial floors where speed is essential. It is a topping, approximately $\frac{1}{8}$ " to $\frac{3}{16}$ " in thickness, applied to a previously prepared base slab, usually concrete. It can be made skid-proof.

Tube Pilots

Q-8 Light, easy-to-handle plastic tube pilots have been developed by Thomas C. Wilson, Inc., Long Island City, N. Y.

The new "Guide-Rite" pilots are for use with heat exchanger and boiler tubes ranging from $\frac{3}{4}$ " to 1" O.D., to speed assembly of tubular equipment by piloting tubes through tube sheets, baffles, and support plates. They are designed to do the same job, within their application range, as much heavier and more expensive models. The plastic pilots have a spring pressure feature that holds them securely in place, yet makes removal easy.



Tips to help you cut impact socket breakage

- Position power wrench so that socket fits straight on nut. Tilted wrench causes binding and socket breakage.
- Use right size socket...replace worn or undersize nuts. Loose-fitting sockets wear faster — then break.
- Don't keep impacting after nut is tightly set. This causes needless wear on both wrench and socket.
- Keep the inside of sockets clean. Dirt and grease are common causes of socket breakage.
- When power wrench drive head becomes worn — replace it. Loose drive causes excess wear in socket drive opening — early socket breakage.

Best tip yet!

ALWAYS USE *Snap-on* INDUSTRIAL SOCKETS

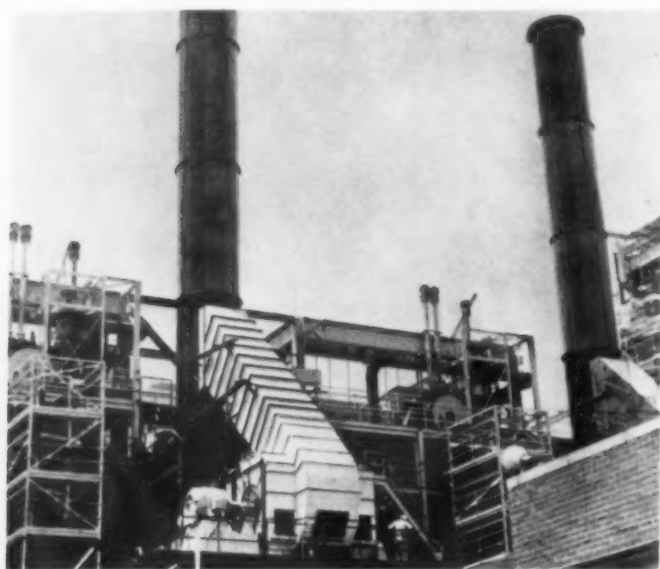
Sockets used on power nut runners and impact wrenches take a terrific pounding. Standard hand-wrench sockets are not designed for this work. Snap-on heavy-duty industrial sockets have the extra heft and toughness to take the beating. Result: more work-hours per socket and, equally important, less costly downtime resulting from fre-

quent breakage of ordinary sockets.

Final tip. Talk sockets with your Snap-on man. Take advantage of his specialized tool knowledge, and his competent advice on what is best for you in the wide range of Snap-on industrial sockets. Your nearby Snap-on branch office provides prompt emergency or regular service.

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New Product Briefs (Continued)



Two eight-foot diameter, 55-foot tall A. O. Smith glass-protected smokestacks at Jacksonville, Florida's Southside Generating Station.

Glass-Protected Smokestacks

Q-9

A steel smokestack lined inside and out with colored acid-resistant glass has been developed by the **A. O. Smith Corporation**, Milwaukee, Wisc.

The new process permanently fuses brightly hued color dyes into the stack's glassed exterior. Extreme temperature and weather conditions have little or no dulling effect on the shiny colored glass and corrosion cannot be hidden under a layer of paint.

Bench Bender

Q-10

Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago 14, Ill., announces its new T-3 Bench Bender for repair or maintenance work and on-the-job applications.

It has direct lever operation for bending soft copper and aluminum up to 1½" diameter, and for bending annealed steel tubes up to 1" O.D. It has ratchet bending action for steel tubes to 1½".

This bench bender uses the "compression" type of bending which gives shorter radii without mandrel use and requires less hand power (rolls the bend in). It can be used for right or left hand bending with tangents of about one tube diameter between bends.

Terminal for Brushes

Q-11

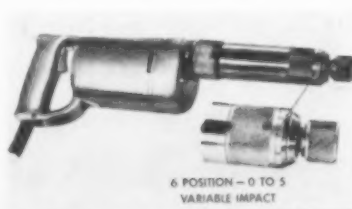
A quick-disconnect terminal assembly for brushes is now available from **National Carbon Company**, Division of Union Carbide Corporation, New York 17, N. Y.

The assembly is designed to facilitate brush replacement on electric utility equipment, and on any motor or generator in which the brushes are difficult to reach. It consists of a stationary clip easily bolted to the machine, into which either one or two terminals can be snapped. All parts are silver-plated beryllium copper.

Impactool For Industrial Use

Q-12

Ingersoll-Rand Co., 11 Broadway, New York, has redesigned its Size 8U heavy duty electric Impactool to give it 20% more power than the previous model. This feature, combined with good balance and a



palm-fitting handle, makes it possible to use the tool over long periods of time without undue fatigue for production and general maintenance work in manufacturing and metalworking industries.

More power is obtained through a heavier impact mechanism, an improved universal motor of 6 amperes (instead of 5 amperes as in the old model), and a T-type socket driver which improves power transmission.

Compound Leverage Wrench

Q-13

The Ridge Tool Company, Elyria, Ohio, has introduced a new compound leverage wrench. Pressure applied on the extra-sturdy malleable handle is multiplied by two as the ad-



justable hook jaw turns the pipe in one direction, while the offset chain vise head grips the fitting and exerts an equal pressure in the opposite direction.

By slipping the removable chain vise head into place on the desired side of the handle, the Compound Leverage Wrench can be used to tighten or loosen right or left hand threads . . . with the pipe on either side of the fitting. Short handle for jaw size makes it ideal for close quarters.

Worn Stairs Restored

Q-14

A method of restoring worn, slippery stairs is announced by **Wooster Products Inc.**, Wooster, Ohio.

Plastic mix leveling compound is troweled over the worn areas to return the step to a level surface. The step is then capped with the new heavy-duty "Super Stairmaster" safety tread. The base of the tread is heavy-duty aluminum with ribs

of diamond-hard abrasive providing an anti-slip walking surface. Proper fasteners are furnished for installing on various types of stairs.

Propane Torches

Q-15 Spatz Paint Industries, Inc., 5237 Manchester Ave., St. Louis, Mo., is distributor for the "Painter's Partner," a propane torch made in Sweden.



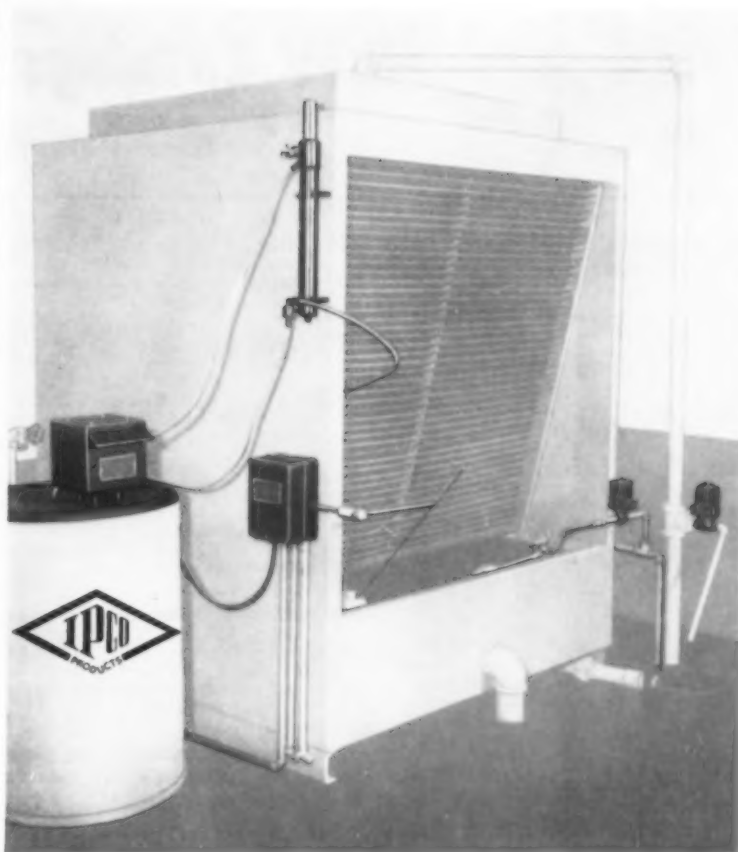
Fuel is fed to the torch through a hose attached to the fuel supply unit, which can be hung on the rung of a ladder, placed on the floor, or even attached to the painter's belt, leaving his hands free to hold the torch and scraper.

The standard kit contains the paint remover torch with swivel adapter, suspension hook, six feet of hose and fuel supply cylinder. Cost is about \$35.00.

Anti-Seize Compounds

Q-16 Crawford Fitting Company, 884 East 140th Street, Cleveland 10, Ohio, is marketing a line of anti-seize and lubricating compounds under the trade name "Goop."

The line includes three separate products. Silver Goop is formulated to prevent seizing and galling regardless of applied load on threaded parts, at temperatures up to 2100 F. It reduces take-up torque on threaded parts. Blue Goop is for use on titanium, stainless steel, steel, aluminum and high temperature alloys. It withstands temperatures up to 400 F. High Purity Goop is recommended for use wherever the prevention of product contamination is essential.



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1—Emergency Chemical Cleaning — 4 page catalog highlights Anco solvents and service trucks available to remove scale, rust and other deposits from all types of heat exchange equipment. — **ANDERSON CHEMICAL COMPANY.**

2—Electrical Maintenance — New contract service (for Southeast only) inspects and tests motors generators, gearing, control and distribution systems, at a cost less than 1% of value of equipment. — Atlanta office of **WESTINGHOUSE ELECTRIC.**

3—Metallizing—Use industry's low-cost "putting-on" tool. Now within reach of the smallest shop. Bulletin tells you how you can spray carbon steels, stainless, babbitts, brass, nickel, aluminum, etc.—**METALLIZING ENGINEERING CO., INC.**

8—Ceramic Coatings — Chempro sprayed ceramic coatings to resist abrasion, erosion and corrosion described in Bulletin CP-28. Ideal for shaft, shaft sleeves, impellers, valves, cams, etc. — **CHEMICAL & POWER PRODUCTS, INC.**

13—Conveyor Belt Repairs — Bulletin R-700 and Folder R-4 describe the "Rema" method of making vulcanized repairs without heat. Holes, gouges, rips and tears can be repaired on the job. Curing time delay is eliminated. Belts can be put into service immediately after repair is made—**FLEXIBLE STEEL LACING COMPANY.**

17—Mechanical Packings — 32 page Cat. PC-103 describes a variety of packings and gaskets, including self-lubricating, sheet and molded packings. Includes application charts and price information. — **GREENE, TWEED & CO.**

For More Free Data FILL IN CODE NO. on the Handy Return Card — Page 85

18—Maintenance Ideas — 4-page folder highlights 90 ways Kano Kroil and other products can help the man-in-the-plant.—**KANO LABORATORIES.**

25—Racks & Shelving—Beam-Strut and Tube-Strut clamps can save you money. 24-page bulletin tells how to make your own. Capacity graphs for standard channel, I-Beam or pipe. — **TUBE-STRUT CORP.**

27—Corrosion Control Systems — Five-step procedure outlined in Brochure 9111 for primary protection and preventive maintenance of all metal surfaces subject to acids, alkalis, solvents, fumes and gases.—**TRUSCON LABORATORIES.**

31 — Stack Maintenance — How wrought iron offers unique defense against flue gas corrosion described in bulletin "Wrought Iron for Flue Gas Conductors."—**A. M. BYERS COMPANY.**

32—Scale Removal — Data sheet on Kwik-Kleen, a completely safe method of rapid scale removal for heat transfer surfaces. — **THE NORTH AMERICAN MOGUL PRODUCTS COMPANY.**

34—Floor Maintenance — 4-page catalog describes metallic, asphalt, latex, epoxy and other products for hardening, resurfacing and patching concrete or wood floors. — **A. C. HORN COMPANIES.**

41—Roof Coating — Booklet "Natural Rubber — its effect on exposed roof and masonry surface" plus information on durable asphalt protective coatings for roofs. — **GARDNER ASPHALT PRODUCTS CO.**

45—Correct Lubrication — "Lubriplate Data Book" shows importance of providing and maintaining proper and economical maintenance of all types of plant machinery through adequate lubrication. — **Lubriplate Div., FISKE BROTHERS REFINING CO.**

53—Steam Line Treatment — Folder describes alkaline IPCO S-L-T. Used in boiler water, it will volatilize and travel with steam to return

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lines. Prevents costly repairs and provides insurance against replacing pipe and fittings. — IPCO LABORATORIES, INC.

64—Anti-Corrosive Paints—Bulletin, "The Application of Subox and Subalox Paints," gives the story of a complete paint system for weather, moisture and alkali protection, with details as to application. — SUBOX, INC.

70—Multi-Purpose Grease — Bulletins describe single product Gulfcrown grease (4 consistencies) that does the work of many—simplifies application and avoids errors, reduces inventory and cuts lubrication costs; grease gun or centralized system application. — GULF OIL CORPORATION.

71—Fibre Roof Coating — Folder covers "the easy and low cost way to repair and renew roofs." — GARDNER ASPHALT PRODUCTS CO.

78—Control Heat & Glare — New folder tells how Sun-X Glass Tinting (transparent alkyd-based liquid plastic by duPont) is applied directly to existing glass by flow process without spray or splatter. Bonds tightly. Wash in usual manner. — AMERICAN GLASS TINTING CORP.

96—Tube Cleaners — Mechanical units for boilers, condensers, evaporators and pipes described in Catalog 77A. Over 100 pages of air motors, cutting heads, drills, etc. — THOMAS C. WILSON, INC.

FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

107—Proportioning Pumps—4 page brochure illustrates and describes company's proportioning pumps and package chemical feeding units. Includes applications and specifications.—THE BIRD ARCHER CO.

122—Industrial Fans—Bulletin 702 covers Type XL fans for air and material handling. Volumes to 130,000 cfm pressures to 18" SP. Catalog 855 describes Pressure Fans. Volumes to 12,000 cfm, 10" to 50" SP. —CLARAGE FAN CO.

135—Heat Exchanger—Bulletin 132 shows how sectional Aero unit gives close temperature control, saves labor, power, and water; design improves heat transfer to outdoor air by evaporation; 7,000,000 to 18,000,000 Btu/hr capacity range. —NIAGARA BLOWER COMPANY.

157—Pumps for Corrosive Liquids—4 page Bulletin 5252-J describes 8 centrifugal pumps particularly

adapted for handling corrosive liquids. Useful chart shows materials of construction available. Sizes, ratings, etc., briefed. — GOULDS PUMPS, INC.

180—Economizer — Bulletin 179 describes cast iron extended surface economizers to provide maximum boiler heat recovery with minimum draft loss and corrosion at low cost. — GREEN FUEL ECONOMIZER CO., INC.

INSTRUMENTS—METERS CONTROLS—REGULATORS

201—Valves & Gages—Handy guide No. 36 gives data and prices on valves, liquid-level gages and acces-

sories for process and power industries. — PENBERTHY MFG. CO.

205—Draft Gages — Bulletins describe inclined, vertical tube, air filter gages, straight line and dial pointer type, minified draft and receiver type gages, velocity gages and pitot tubes, gas analyzers and steam calorimeters. — ELLISON DRAFT GAGE CO.

212—Self-Powered Controls — Bulletin 620 describes self-powered automatic temperature regulators—no compressed air or electrical wiring required, no delicate mechanisms to adjust, no packing glands to stick, no shut-down due to power failure. —SARCO COMPANY, INC.

(Continued on page 88)

ELECTRICAL MAINTENANCE — Help for the Man-in-the-Plant

801—Motors—Bulletin describes and catalogs more popular a-c motors from 1 to 600 hp. for every process and manufacturing requirement. Single phase and polyphase; surpass NEMA specifications. — BROOK MOTOR COMPANY.

807—Motor Bearings — Catalog 258 gives complete listing of cast bronze motor bearings for all makes and sizes.—THE BUNTING BRASS AND BRONZE COMPANY.

813—600-Volt Wiring — How Anaconda Densheath 900 offers long life, high heat and moisture resistance, chemical stability and easy installation is described in Bulletin DM-5612 — ANACONDA WIRE & CABLE CORP.

816—High Voltage Protection — 36 page catalog of linemen's protective equipment describes products for utility and industrial electrical fields. — CHARLESTON RUBBER COMPANY.

820—Electrical Maintenance — New contract service (for Southeast only) inspects and tests motors, generators, gearing, control and distribution systems, at a cost less than 1% of value of equipment. — Atlanta Office of WESTINGHOUSE ELECTRIC.

855—Wiring Analyzer — 4 page bulletin describes Model 301 Adequate Wiring Analyzer which quickly, simply and easily tests wiring without confusing calculators or slide rules.—SPRAGUE ELECTRIC COMPANY.

871—Electrical Protection — Handbook tells how to select protective devices for circuits, motors and apparatus. Condenses all '59 Code references covering protection

problems. Explains how installation costs can be cut and space saved with Dual-Element fuses.—BUSS-MANN MFG. DIV.

874—High Voltage Rubber Cables—32 page catalog contains information on design features, insulations available, and performance highlights of company's butyl rubber power cable, Durasheath. Also data on kinds of available constructions from 600 v to 15,000 v conductors. — ANACONDA WIRE & CABLE CO.

875—Limit Switches — 16-page Booklet 802T describes new line of oil tight limit switches — operating heads and switch bodies completely sealed. — ALLEN BRADLEY.

877—Motor & Commutator Maintenance — Line of resurfacers, flexible abrasives, grinders, brush seaters, undercutters and other tools described in Motor Maintenance Products catalog. — IDEAL INDUSTRIES, INC.

880—Electrical Test Kit — Amprobe literature describes Test-Master Kit — all equipment you need for electrical testing jobs. — PYRAMID INSTRUMENT CORP.

882—Fuses — Dual-Element catalog tells you how fuses stop needless blows, minimize downtime and provide protection against burnouts. —ECONOMY FUSE AND MFG. CO.

885—Electrical Maintenance — File 21 tells you how to set up good electrical testing program — insulation resistance testing, motor & phase testing, cable fault location, etc. — JAMES G. BIDDLE CO.

Bulletins (Cont.)

213—Meters & Controls — Bulletin G15-1 describes and illustrates systems and instruments used in the measuring, transmitting, receiving, interpreting and controlling of 18 variables normally encountered in power plant and industrial plant operation.—BAILEY METER COMPANY.

222—Pressure Regulators — Catalog No. 77 illustrates and describes application, operation and specifications for a complete line of reducing, back-pressure and pump-pressure regulators.—MASON-NEILAN

224—Feedwater Regulator—Bulletin 1044 describes the BI Feedwater Regulator, the single-element unit employing a thermostatic-tube level controller which actuates a regulating valve in feed line. For loads from 10 to 785 psig. Includes specifications table and schematic diagram. — COPES-VULCAN DIV.

228—Fuel Cut-Outs & Water Level Alarms — Brochure D2 — Electrode type equipment for installation on water columns to provide fuel cut-out, high and low water level alarms and pump cut on and

off. For pressures to 2500 psi. — RELIANCE GAUGE COLUMN CO.

235—Liquid Level Gauges—Bulletin 463A describes automatic remote reading systems for nearly any liquid. Features include easy to read dial indication. — LIQUIDOMETER CORP.

267—Remote Liquid Level Indicators — Bulletin RI-1825 describes indicators for pressures up to 3000 psi —advantages, operation and specific installations. — YARNALL - WARING COMPANY.

281—Control Valves—8 page Bul. J-170 describes sliding gate and plate control valves. Includes engineering data, cutaway drawings, features, application information, dimensional drawings, flow capacities, rating charts, flow curve and sample specifications. — OPW - JORDAN.

PLANT CONSTRUCTION—WELDING EQUIPMENT—SPECIALTIES

300—Fact Folders — Up-to-date industrial fact-file folders on aluminum, steel, copper, stainless steel, insulation, roofing and other indus-

trial supplies immediately available from 9 Southern warehouses.—REYNOLDS ALUMINUM SUPPLY CO.

301—Vacuum Cleaning Systems — How portable and stationary systems cut costs and increase plant efficiency shown in Booklets P8 and AB-100. Eight heavy duty units (1½ to 15 hp) for cleaning hard to get at areas, reclaiming valuable materials. — U. S. HOFFMAN MACH. CORP.

304—Backing Rings — Bulletin 56-2 describes rings designed for fast economical fit-up in piping, tubing, fittings and valves. Shows how rings assure uniform complete-penetration welds and ease of handling in both shop and field. Carbon steel, wrought iron, chrome alloys, stainless, aluminum and copper—ROB-VON BACKING RING COMPANY.

310—Incinerator — Metal cased, insulated, refractory lined incinerators for industrial and commercial use. City smoke code approved. Fast, economical installation — any size and capacity.—NORTH STATE PYROPHYLLITE CO.

315—Pressure Vessels — Catalog 100 discusses plate fabrication problems and shows how company custom-fabricates hot water storage heaters, tanks, air receivers, blow-off tanks. Corrosion resistant linings and materials featured. Suggested specifications and other valuable technical data given. — J. J. FINNIGAN CO.

316—Drainage & Construction—Catalog Gen-10658 includes data on drainage and construction products for industrial uses. Includes corrugated metal pipe, paved-invert pipe, Asbestos-Bonded pipe, Multi-Plate pipe, pipe-arches, perforated pipe, water control gates — ARMCO DRAINAGE & METAL PRODUCTS, INC.

322—Heat Transfer Cements — Engineering Data Book 502 includes calculations, estimating and installation procedures on properties and uses of Therman heat transfer cements. Contains complete list of Southern engineering representatives.—THERMON MANUFACTURING COMPANY.

323—Mercury Vapor Fixture — Industrial color corrected units described in Bulletin 401. "Stabilux Socket" secures bulb end of lamp, eliminating lamp rupture and breakage from vibration. — WIDE-LITE CORP.

324—Painting New Plants — "Plan Painting of New Plants to Reduce Costs" describes how company's lead-suboxide paints can save 1 or 2 coats of paint on new plants. Eventual repainting costs are cut as well



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- Muse, Inc., Johnson City, Tenn.

since these paints form a dense, metallic lead film which can be recoated without expensive scraping, sanding or repriming. — SUBOX INC.

330—Elevated Water Storage—4-color catalog describes the Aquatore — a new elevated water tank design with capacities from 300,000 to 3,000,000 gallons. Many design advantages including no struts or tie-rods. — GRAVER TANK & MFG. CO.

342—Power Roof Ventilators — Bulletin 550 describes V-belt driven centrifugal type power roof ventilators. Pressures to 2" SP; capacities from 1500 to 26,500 cfm.—CLARAGE FAN CO.

355—Steam-Jet Cleaners—Bulletins JC-100 and SG-200 describe steam-jet cleaners. Series "R" Speedy electric generates steam to 250 psig and temperatures to 405 F. Larger cleaners available.—PAN-TEX MFG. CORP.

365—Storage Water Heaters — Gas-fired, Scalefree 230 units described in Bulletin 4. Fully automatic package requires only simple connections. Available in more than 100 storage and recovery combinations. Storage capacities range from 250-4000 gal.—THE PATTERSON-KELLEY CO.

386—Rigid Frame Buildings—8 page bulletin "Dixisteel Rigid Frame Buildings" — low cost, flexibility of design, durability, and minimum maintenance; also triangular or bow-string truss all-steel roof systems; fabricated for rapid erection. — ATLANTIC STEEL COMPANY.

PIPING—VALVES—FITTINGS STEAM SPECIALTIES—TRAPS

405—Temperature Problems—4 page folder "Service for Efficient Thermal Conservation" covers insulation solutions for high and intermediate temperatures, heating and air conditioning-low pressure steam, and ice water and frigid temperatures. — MUNDET CORK CORPORATION.

406—Blow-Off Valves—Unit-tandem valves for boiler pressures up to 665 psi described in Bulletin B-435. Tells how to specify and how to order.—YARNALL-WARING COMPANY.

409—Lubricated Plug Valves—Catalog PV-4 covers operational features. Quarter-turn to open or close; lubricant grooves provide positive seal when valve is closed; when open, seating surfaces not exposed.—THE WM. POWELL COMPANY.

(Continued on page 90)

BUNTING BEARINGS

Bunting local machine shop service solves many critical problems

One, or small lots of specially designed bearings, not obtainable from stock, can now be procured immediately through your Bunting Distributor. Fully equipped machine shops in Bunting Branches are at your service for emergency and experimental needs. The wide range of sizes of Bunting stock cast bronze and sintered bronze bearings makes easy the alteration of a stock to a special bearing at low cost. Bunting Cast or Sintered Bronze and Bunting Bearing Aluminum Bars provide the material for special sizes and designs which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.

Case in Point Showing some common alterations of Bunting Standard Stock Cast Bronze Bearing, No. G-1191. Size $1\frac{1}{4}$ " ID x $1\frac{1}{4}$ " OD x 2" length.



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No. 158—Complete listing of sizes of Bunting Cast Bronze and Sintered Bronze Bearings and Bars and Bunting Bearing Aluminum Bars. Pocket size edition.

No. 258—Complete listing of Cast Bronze Electric Motor Bearings for all makes and sizes of electric motors.

No. 46—Technology of Bunting Bearing Aluminum. A technical treatise on the composition, machining and use of this new bearing metal. Ask your local Bunting Distributor.

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TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

BEARINGS, BUSHINGS, BARS & SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

(Continued from page 89)

411—Steam Trap Book — 48 page manual reviews importance of good trapping. Gives complete data on traps and strainers. Contains complete selection, installation, testing and maintenance information. Many useful tables and charts. — ARMSTRONG MACHINE WORKS.

412—Power Piping — 8 page brochure describes latest computer methods of analyzing power piping designs. — THE M. W. KELLOGG CO.

422—Welded Steel Pipe — 40 page catalog describes applications, advantages, standard specifications, production limits, linings and coatings, fittings, joints, of welded steel pipe. Data tables, drawings, and illustrations included. — ARMCO DRAINAGE & METAL PRODUCTS, INC.

429—Expansion Joints—Advantages of the Gun-Pakt expansion joint described in Bulletin EJ-1917. No shutdowns for repacking. Installation suggestions. — YARNALL-WARING COMPANY.

437—Piping for Permanence—Bulletin covers a variety of services where wrought iron pipe saves be-

cause it serves longer. Corrosion costs you more than wrought iron. —A. M. BYERS COMPANY.

443—PVC Fittings & Flanges—Corrosion resistant polyvinyl chloride pipe fittings and flanges covered in 12 page catalog, featuring characteristics, advantages, limitations, operating pressures, temperatures, field tests, etc.—GRINNELL COMPANY, INC.

463—Stainless Steel Valves — Catalog 59 SS describes complete line of gate, globe and swing check valves with full details of valve patterns in alloys that satisfy requirements of most corrosive services. Includes section to show degree of resistance of alloys to many corrosive media under varying conditions. — JENKINS BROS.

465—Water Hammer — Cause, effect and control covered in Bulletin 851. — THE WILLIAMS GAUGE CO., INC.

466—Pipe Insulation — Folder describes Superglas with "hinged action" — made in one-piece, full length sections open easily to speed installation; easy cutting and fitting; temperature limit is 350 F. — MUNDET CORK CORPORATION.

BOILERS—STOKERS TURBINES—BURNERS

502—Feedwater Treatment—4 page catalog tells how Braxton and Flako internally condition water so as to remove and prevent scale formation and corrosion in boilers. — ANDERSON CHEMICAL COMPANY.

505—Refractories — Paco High Heat Duty and Super Duty Plastic Refractories. Fire brick, high temperature cement, castable. Installation and engineering service. Free estimates and inspection. — NORTH STATE PYROPHYLLITE CO.

KEEP UP-TO-DATE USE SPI READER SERVICE

See Pages 85 & 86

506—Package Boilers — Practical construction with Continental two pass design described in Bulletin BE100. Units range in size from 20 to 600 hp; 15 to 250 pressures burning oil, gas or combination. — BOILER ENGINEERING & SUPPLY.

509—Free Coal Counseling — General information on how Coal Bureau engineers will advise on selection, transportation and utilization of the right coal for your purpose.—NORFOLK AND WESTERN RAILWAY.

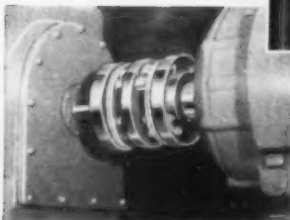
515—Packaged Steam Generators — Bulletin PSG-2 describes factory assembled portable type units from 10,000 lb/hr to 40,000 lb/hr capacities. Gives construction details and dimensions. In standard pressures of 175, 250 and 375 psi gauge.—HENRY VOGT MACHINE CO.

516—Small Boiler Performance — 4 page bulletin shows how the packaged Ljungstrom air preheater boosts performance. Boilers as small as 25,000 lb/hr can have advantages of regenerative preheating—saves fuel, boosts output, and permits use of lower grade fuels.—THE AIR PREHEATER CORPORATION.

519—Feedwater Deoxygenation — 12 page Bulletin BW-7 describes advantages of chemical deoxygenation of boiler feedwater with an aqueous solution of Hydrazine. Covers in detail the properties and action of Hydrazine in maintaining boilers as well as recommended methods of application. — FAIRMOUNT CHEMICAL CO., INC.

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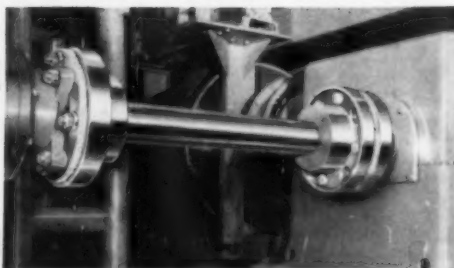


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WARREN, PENNSYLVANIA, U.S.A.



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offer all these advantages:**

- 1 Freedom from Backlash
Torsional Rigidity
- 2 Free End Float
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Constant Rotational Velocity
- 4 Visual Inspection While in
Operation
- 5 Original Balance for life
- 6 No Lubrication
- 7 No Wearing Parts
- 8 No Maintenance

530—Coal Plant Specifications — 64 page brochure, including 5 drawings, is a comprehensive guide for preparing specifications on coal-fired, low-pressure heating plants in the size range of 750,000 to 5,500,000 Btu/hr. All aspects affected by choice of fuels from storage bin to stack design covered fully. — BITUMINOUS COAL INSTITUTE.

532—Economical Steam — Forced draft, pressurized gas or oil fired units described in SB-59 catalog. Two-drum water tube units include steam trim, draft equipment, burner and combustion safety controls. — ERIE CITY IRON WORKS.

535—Unit Steam Boilers — Catalog AD-100 — Gives complete information on oil and gas fired "Self Contained" boilers, 15 to 500 hp, 15 to 250 psi for processing and for heating. Gives features, applications, efficiencies, capacities and dimensions. — CLEAVER-BROOKS CO.

542—Underfeed Stoker — Illustrated Cat. 401 gives complete data on double retort underfeed stoker built for heavy duty service in intermediate size range for boilers of 20,000 lb to 34,000 lb of steam/hr capacity. — DETROIT STOKER CO.

547—Gas and/or Oil Burners — Bulletin B1 describes large or small, single or dual fuel, packaged or field assembled, atmospheric or forced draft; electronics of all types; competent sales and service. — WEBSTER ENGINEERING CO.

574—Packaged Generator — Bulletin 582 describes Vapormatic Coil-N-Shell Steam Generator for service requirements of 5 to 150 psig. Gives operation features and specification data. Available with gas, oil, and combination gas/oil fuel systems. — TEXSTEAM CORP.

**ENGINES—DRIVES
POWER TRANSMISSION
MATERIAL HANDLING**

600—Mechanical Shaft Seals — Chempro mechanical external seal described in Bulletin CP-551. First seal designed for complete interchangeability with packing. No mounting clamps, machinery stuffing box faces or drilling holes. Install in 30 min. Adjust after installation. — CHEMICAL & POWER PRODUCTS, INC.

602—Pneumatic Ash Conveyors — Bulletin S57-A describes pneumatic ash conveyors for rugged, wear-resistant pipe and fittings that provide lower maintenance cost per ton of ash covered. — NATIONAL CONVEYORS CO. INC.

(Continued on page 92)

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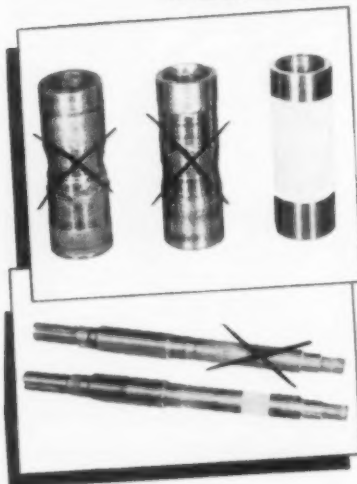


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Chempro's new extremely hard, chemically inert ceramic coatings applied to shafts and shaft sleeves eliminate the costly failure of "chewed up" or "scored" shafts and sleeves. Sprayed ceramic surfaces are highly resistant to abrasion, erosion and fretting corrosion under even the most difficult slurry service. They also give ideal protection against shaft wear under high packing gland pressures.

Pump down-time due to shaft or sleeve failure has been drastically reduced in every installation in which Chempro's sprayed ceramic surfacing has been used.

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606—Retaining Ring Kits—400 Tru-arc cadmium plated rings — 84 sizes in one economy kit. Sizes from 1/4 to 2 1/2 in. in three most used series of internal, external and universal crescent ring designs—\$34.50 per kit. — **DIXIE BEARINGS, INC.**

610—Flexible Couplings — All metal couplings described in Catalog 51A have no wearing parts; offer freedom from backlash, torsional rigidity; free end float; smooth continuous drive; and visual inspection in operation. — **THOMAS FLEXIBLE COUPLING CO.**

615—Dial Scales — Catalog gives specifications on dozen of standard and special types for industry. Accessories for printed weight records, remote weight indications, etc. — **THE HOWE SCALE CO.**

635—Bearings & Bars—Pocket size edition 158 gives complete list of cast bronze and sintered bronze bearings and bars. Bearing aluminum bar data included.—**THE BUNTING BRASS AND BRONZE COMPANY.**

640—Belt Conveyors — Manual 909 designed to serve both expert and layman in field of materials handling by conveyor. All but the most unusual applications can be specified from the contents. — **JEFFREY MFG. CO.**

WATER TREATMENT—HEATING & AIR CONDITIONING—DUST & FUME CONTROL—REFRIGERATION

701—Peak Load Problems — Keep your air conditioning and refrigeration systems operating at maximum efficiency during coming peak load months. Catalog tells how Anco treatment removes rust and scale and kills slime and algae in your equipment. — **ANDERSON CHEMICAL COMPANY.**

703—Air Conditioning — Bulletin 122 describes and illustrates operation and suggests applications for air conditioning method that controls humidity to 1% rh and temperature to 1 F (up to 140 F) with accuracy, independent of moisture sensitive instruments. — **NIAGARA BLOWER CO.**

706—Automatic Roof Cooling—Bulletin shows how automatic evaporative roof cooling can reduce inside temperature 8 to 15° without air conditioning; increase roof life; and reduce fire hazards. Many Southern installations. — **APRIL SHOWERS — SOUTHERN.**

707—Mechanical Dust Collector — Aerodyne dust collector described in Bulletin 171 combines high

efficiency collection with very low draft loss and extreme flexibility of installation.—**GREEN FUEL ECONOMIZER CO., INC.**

708—Zeolite Softener — 8 page Bulletin 4530-A discusses the hydrogen zeolite process — its advantages, chemistry and neutralizing variations. — **COCHRANE CORP.**

711—Refrigeration Condensers—Bulletin RC-2 shows how Vogt condensers step up rate of heat transfer and step down head pressures. Closed type for clean waters; film type where water is hard and forms scale. Units save power and refrigeration cost. — **HENRY VOGT MACHINE COMPANY.**

716—Dust Collection—Whether nuisance elimination or process material recovery, check on Whirlex Dust Collector Units. Engineering data available. — **THE FLY ASH ARRESTOR CORP.**

764—Cooling Equipment — Bulletin 80-D describes company's complete line of commercial and industrial equipment—operating principles, design features, etc. — **FRICK COMPANY.**

771—Water Treatment — 4 page brochure points out company's 8-point water treatment coverage for elimination of scale, sludge, corrosion and impure steam. — **IPCO LABORATORIES, INC.**

Late Bulletins

E-1—Conveyor Idlers — Bulletin 171, 48 pages, covers engineering and product data on basic types of idlers in various services including troughing, impact, transition, return, flat belt, wire rope, and others. — **HEWITT-ROBINS, INC., Stamford, Conn.**

E-2—Lubricant Sample — Bulletin 126B, 4 pages, accompanies free sample of Molykote G, a grease consistency lubricant to eliminate fretting, galling, seizing, and metal pick-up in high bearing pressure applications such as heavily loaded gears, cold metal forming, threaded connections and press fitting. — **THE ALPHA-MOLYKOTE CORPORATION, 65 Harvard Ave., Stamford, Conn.**

E-3—Aluminum Alloys — "Olin Aluminum Mill Products," 24 pages, describes physical properties, fabrication characteristics, and economic advantages of a variety of aluminum sheet, plate, rod, bar, extrusion, and casting alloys.—**OLIN MATHIESON CHEMICAL CORPORATION, Metals Division, 400 Park Ave., New York 22, N. Y.**

E-4—Chain & Sprockets — Bulletin

A691, 56 pages, covers expanded line of roller chain and Taper-Lock sprockets, including single strand, double strand, single strand heavy series, double pitch drive, double pitch conveyor, and standard attachments. Complete with selection data and prices.—DODGE MANUFACTURING CORPORATION, Mishawaka, Ind.

E-5—Power Tools — 1960 Catalog,

64 pages, illustrates and describes complete line of power tools for industrial production, plant maintenance, wood and metalworking, and other applications.—SKIL CORPORATION, 5033 Elston Ave., Chicago 30, Ill.

E-6—Pyrex Pipe—Bulletin NE-3, 46

pages, illustrated with photographs and diagrams, explains design and installation of Pyrex brand glass pipe and fittings. Engineering recommendations and data cover temperature, pressure drop, thermal expansion, working stresses and flexibility. Maintenance and cleaning information is included. — CORNING GLASS WORKS, Technical Products Division, Corning, N. Y.

E-7—Fusion Welding Aluminum —

Technical Handbook, 32 pages, covers gas welding; metal arc welding; tungsten, inert-gas welding; straight polarity TIG; metal, inert-gas welding; and welded joint design. Tables and diagrams present data on typical welding conditions and equipment. — REYNOLDS METALS COMPANY, Dept. PRD-31, Richmond 18, Va.

E-8—Industrial Fasteners — Un-

brako Hi-Life folder, 4 pages, illustrates and describes socket head cap screws and other precision fasteners which feature larger and more uniform root radius of concave configuration, made possible by controlled thread root form. — STANDARD PRESSED STEEL CO., Attn: A. W. Scott, Adv. Serv. Dir., Jenkintown, Pa.

E-9—Centralized Lubrication — Bul-

letin No. 26-T, 24 pages, contains information on complete line, discusses principles of operation, illustrates typical applications, includes system components. — FARGAL DIVISION, EATON MFG. CO., 3300 E. 80th St., Cleveland 4, Ohio.

E-10—Ultrasonic Thickness Testers

—Bulletin A-200, 8 pages, details two portable thickness testers — ultrasonic gages which permit measurement of thickness from only one side of a variety of materials including metal, glass, and plastic, by relating a variation in thickness to the change in resonant frequency.—BRANSON INSTRUMENTS, INC., 40 Brown House Road, Stamford, Conn.

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SPEEDYLECTRIC

Electric Steam Generator



- ★ Low cost
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This compact, easily installed 1½ h.p. generator develops steam at pressures up to 100 psi at very low cost! Sets close to equipment. For 220, 440 and 550-volt service. A.S.M.E. code. Write now for descriptive bulletin!

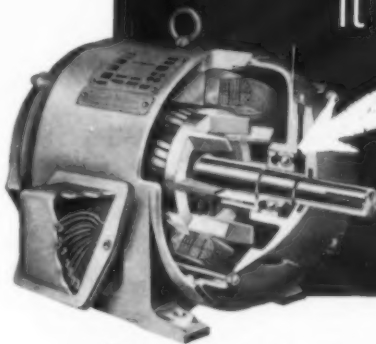
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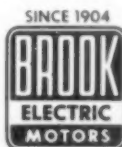
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MANY MOTORS look practically alike on the outside, but it's what is inside that counts. There is no motor with better windings or more ample bearings — few motors compare favorably. Yet, the Brook Motor costs less, because of volume production, modern techniques, distribution in 76 countries and a realistic pricing policy. Brook Motors have established excellent performance records for over 56 years in every industry using a.c. motors. From 1 to 600 H.P. Send for literature.



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SAFETY ZONE



The distance between the floor of your plant and your overhead valves is a DANGER ZONE when piled up boxes or even ladders are used to reach the valves.

Turn it into a SAFETY ZONE — equip your overhead valves with Babbitt Adjustable Sprocket Rims with Chain Guides.

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Babbitt Adjustable Sprocket Rims with Chain Guide are carried in stock by most mill supply houses. If your supplier does not carry them, contact us direct.

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Convention Report

ASME Gas Turbine Conference

Houston, Texas

March 6-9

By ELTON STERRETT

Industrial Consultant
Houston, Texas

A TRULY INTERNATIONAL PROGRAM characterized the fifth annual conference and exhibition of the Gas Turbine Division of the American Society of Mechanical Engineers, held in conjunction with the Hydraulic Division of the Society in Houston, Texas, March 6th to 9th. Eight of the papers had foreign origin, with Rheinhafen, Germany; Winterthur, Switzerland; Paris, France; Bristol, England; Haifa, Israel; Pretoria, South Africa; Beirut, Lebanon; and Caracas, Venezuela contributing papers to highlight the cosmopolitan scope of mechanical engineering.

THE SCHEDULE of papers included 42 titles; a hydraulic symposium on cavitation with six papers; and a three-session, 11-paper symposium on compressor stall, surge and system response. More than 800 engineers and scientists, taxing the seating capacity of the conference rooms, attended the two 8 P. M. sessions justifying that method for crowding 20 groups into a three-day meet.

Apart from the two symposia, the program divided easily into two types of presentation: one detailing operating experience with some type of combustion turbine; the other, a manufacturer's description of some outstanding development made by his company in turbine design or application.

New Designs

A paper by R. L. Boyer, of Cooper Bessemer, outlined his company's plans for a 10,500 hp gas turbine. A modification of the J-57 jet engine will constitute the initial three stages of the unit, and a two-stage turbine is added to deliver power (in the case of the experimental unit now under construction) to a natural gas pipeline compressor. This is the unit to be installed by Columbia Gulf System at its Campbellsville, Kentucky, mainline station.

O. C. Schoeppner, of Clark Brothers, described his company's 9000 hp, single-shaft turbine. The

engine incorporates a rigid shaft, with spool between compressor and turbine blading, and with but two bearings, both outside the turbine case. It utilizes dual, vertical combustion chambers, their gas streams separate until entering the turbine nozzles.

The third turbine development described was the 1100 hp unit being pioneered by Solar Aircraft Company. The company engineer, P. A. Pitt, told how this ultra high speed unit, designed to operate at speeds up to 30,000 rpm, will be direct-connected to a multistage compressor for natural gas pipeline work. Interchangeable wheels and accessories will enable the compressor to be quickly adapted to varying conditions of pressure and flow. This unit will be installed on an experimental basis by Trunkline Gas Company in its Cypress, Texas, station.

Application & Operation

Combustion turbine burning of blast furnace gas, either as bled from the furnace system or enriched with other fuels, came in for discussion in two papers, both of European origin. Blast furnace gas, though low in unit heat value, was found to be a neutral fuel, in that no corrosive effects were discernable on turbine blades, even in the hottest area of the turbine.

THE GAS-STEAM CYCLE, with the turbine exhaust gases passed through boilers for the gen-

eration of low-pressure steam, was covered for an entire session, with three papers devoted to that subject.

P. F. Martinuzzi, Stevens Institute of Technology, detailed his observations in the field of such power generation; followed by a paper authored by M. Eisler and W. M. Sybert, of Kaiser Engineers, who advocated the use of such combinations for meeting peak loads in electric generating plants.

G. L. Morris, of Brown & Root, Inc., summarized the studies made in designing the plant, including installed cost, ease of operation, simplicity and over-all efficiency for an operating industrial installation which his company engineered and constructed.

The plant includes two 7500 hp simple cycle gas turbines, driving process equipment; two 30,000 lb per hr watertube, two-drum, pressurized recovery boilers with stack-type economizer for heating feedwater for the recovery boilers and power boiler plus a separate economizer for process feedwater heating; and two 40,000 lb/hr watertube, two-drum, balanced draft power boilers capable of using either air or turbine exhaust gas for combustion air.

The idle boiler is always kept hot, in stand-by condition, by passing controlled amounts of 525 F exhaust gas through it. It can thus be fired and brought to operating pressure in minimum time.

THE EXHAUSTIVE symposium on compressor stall, surge and system response, occupying three full sessions and incorporating 11 papers, was summarized by the compilation, within a single cover, of brief expositions of their subjects by the several authors concerned. Although labelled "brief," this book occupies 56 pages of standard magazine size.

NO GAS TURBINE conference would be complete without at least one paper comparing the operating characteristics of two-shaft and single-shaft turbines, in this instance for driving gas pipeline compressors.

The paper, by M. J. McDonough, of Westinghouse Electric Corporation, describes and compares the two types of turbine along a typical compressor loading line for

constant station discharge pressure. Horsepower-speed relationships and specific fuel consumption are considered. The author urges weighing the load factor in turbine selection. For load factor, where recirculation is required during the summer slack period, the added cost of fuel consumption in such an operation must be recognized.

He concludes that there are applications for both types of turbine: generally specifying the two-shaft unit for low load-factor conditions and the single-shaft type for lines having high load factor, because of the latter design's simplicity and good efficiency.

B. G. MARKHAM, Bristol Siddeley Engines, Ltd., made a good case for the use of strategically located small gas turbine plants for coping with peak power demands. He pointed out that the turbine plant could be put on the line in a fraction of the time in which a steam unit could be made ready, and that the initial investment would be much less than where a boiler, generator and accessories must be bought and housed.

The turbine plants, distributed in a municipal power network, could also cut line losses by reducing the amount of high-line transmission required to make their power available, as compared to a centrally located, larger steam plant.

If the gas turbine plant can prove itself economically sound for installations in England, where the fuel cost is high, it should find even wider fields of application in areas where petroleum fuels either liquid or gas, are available at low rates. The ability of combustion turbines to operate for long period on residuals, for instance, makes such an installation very attractive.

EXHIBITS shown in connection with the conference highlighted the amazing development of the combustion turbine since the first such showing at the initial meeting of the Gas Turbine Division five years ago.

The 1961 Conference and Exhibition of the Gas Turbine Division of ASME is scheduled for Washington, D. C., March 5th to 9th.

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for pressures to 10,000 psi and higher.

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clear, accurate liquid-level readings on tanks, boilers, vessels, flow lines, etc.

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TWO-BED DEMINERALIZER**

Pictured above is a large heavy duty demineralizer with solo valve manual control, located at a Florida Air Force Base.

One of many demineralizers and water conditioners designed and manufactured by Southern Water Conditioning, Inc.

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All types of Domestic, Commercial, and Industrial Water Softening and Conditioning Equipment: Filters - Taste and Odor Removers - Aerators - Demineralizers - Zeolite, Ion Exchange Minerals in stock - Residential and Commercial Package Swimming Pool Filters - Also Rebuilding and Modernizing



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GREENE, TWEED & CO.
NORTH WALES, PA.

Southern News Briefs (Continued from P. 12)

Worthington — Atlanta

Worthington Corporation has established a new Southern Resale Region, with R. N. Franz as manager. Headquarters are in Atlanta



and the region covers sales territories of Atlanta, New Orleans, Houston, Dallas and Tulsa.

Mr. Franz received his B.S. degree in Industrial Engineering from Lehigh University. He started with Worthington in 1949 in the Merchandising Division. He spent several years in Construction Equipment Sales in Atlanta, and in 1958 was appointed Regional Resale Manager for the Central States, where he is now succeeded by F. J. Reardon.

Continental Conveyor Opens Tenn. Warehouse

Continental Conveyor and Equipment Company is opening a warehouse at 1722 Chelsea Ave., Mem-



phis, Tenn., under the supervision of C. R. Helm, District Manager.

Mr. Helm has been located in Memphis since 1956, acting as sales engineer for Continental Conveyor's predecessor, the Industrial Division of Continental Gin Company.

New Orleans Public Service Vice-Pres. McCoard Dies

Albert Babcock McCoard, vice-president and principal financial officer of New Orleans Public Service, died on March 25.

A native of New Orleans, Mr. McCoard was connected with Public Service and its predecessor companies for over 56 years, having started as an office boy in 1903. After holding a number of positions in the auditing department of the Company, he was named general auditor in 1918. He was successively appointed comptroller, executive assistant, and was elected a vice-president in 1939. He had been a director of the Company for over 25 years. Mr. McCoard was widely known as an authority on public utility financing.

Bailey Meter — La.

Bailey Meter Company has announced that W. P. Davenport, formerly an industry specialist in The



Pulp & Paper Division, has been named manager of the New Orleans district succeeding S. G. Dukelow, who is now manager of the San Francisco district.

Mr. Davenport joined the company in 1937 as an engineering trainee. He holds a B.S. degree in mechanical engineering.

C & D Batteries—Ala.

General Machinery Company, headed by Mr. Edward T. Wilkinson, Jr., 1600 Second Ave., South, Birmingham, has been appointed Sales and Service representative for Alabama, by Mark C. Pope Associates. The Pope organization represents C & D Batteries, division of The Electric Autolite Company, in Atlanta, Georgia.

Pioneer Rubber Co. — Tex.

Wayne L. Niedens has been appointed sales representative by The Pioneer Rubber Company of Willard, Ohio, for the company's Texas subsidiary.



He will make his headquarters in New Orleans to cover the territory including Arkansas, Louisiana, Mississippi, western Tennessee and the Houston, Texas area for Pioneer's industrial glove products.

Mr. Niedens has had extensive experience in the field of industrial merchandising. Prior to joining Pioneer of Texas, he was associated

with Western Waterproofing Company, Boston Frozen Foods Company and Lever Brothers. A native of Kansas, Mr. Niedens received his college training at Union College and at Tulane University.

Sou. Pipe Coating—Ga.

L. R. Mobley has been appointed sales representative in the Southeast for Southern Pipe Coating Com-



pany, Atlanta, Ga. Mr. Mobley has more than ten years' experience in the pipe field, serving previously as a sales representative for a large manufacturer of piping, plumbing and heating materials.

I-T-E Miami Office

I-T-E Circuit Breaker Company, Philadelphia, has appointed C. E. Wood district manager of its Miami



sales office at 4216 Ponce de Leon Blvd., Coral Gables, Fla. Mr. Wood succeeds Lee Hamilton, resigned. The Miami office handles sales of I-T-E equipment in the Southern part of Florida.

Mr. Wood joined I-T-E in 1953 as a sales representative. In 1957, he became head of the Philadelphia district office Resale Market group.

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Southern News Briefs (Continued)

PLANT PERSONNEL

The following promotions have been announced by Oklahoma Gas & Electric Company: In the generation department **John D. Graham**, formerly assistant chief engineer at Mustang Station, is now chief engineer. **George Gibbons**, formerly at Riverbank Station, has replaced Mr. Graham as assistant chief engineer. Riverbank's new assistant chief engineer is **George Binkley**, who for the past eight years has been results engineer at Horseshoe Lake Station.

John G. Robinson is mill manager of the new Bowater Board Co. plant at Catawba, S. C.

Dr. Albert C. Hall, director of research and engineering for The Martin Company, Baltimore, has been named vice-president in charge of engineering.

R. L. Casady is general manager of the new sheet plant recently completed by Hoerner Boxes, Inc., at Springfield, Mo. **A. Eugene Palmer** is superintendent.

Western Electric—Missouri

The Western Electric Company is starting construction on an expanded manufacturing plant on Route 50 at Lee's Summit, Mo.

The entire plant will be built at one time, rather than in stages as announced last fall, according to Donald P. Wilkes, manager of the plant. Start of initial construction was delayed so that architectural plans could be prepared for the full project.

The new plant will involve an investment of about \$25,000,000 and will provide an employment potential of 5,000 men and women.

There will be three major components to the full plant — two will house manufacturing operations and the third will provide office facilities. The company expects the first sections of the new plant to be ready for occupancy by early 1962, and the entire plant completed before the end of that year.

In preparation for erection of the new plant on Route 50, pilot operations have been conducted at 1227 East 119th Street, Grandview.

TCI—Atlanta

The Charlotte, N. C., District Sales Office of **United States Steel's Tennessee Coal & Iron Division** will be moved to Atlanta in the near future, it was announced recently by David A. Challis, Jr., TCI vice-president of sales.

The transfer is being made to improve efficiency of service to customers in the district, Mr. Challis said. When the move is made to Atlanta, three sales territories now in the Fairfield, Ala., Sales District will be transferred to the jurisdiction of that office. There will be no change in service to customers in North and South Carolina. Representatives will call on them just as frequently as in the past.

Welsh Mfg. Co. — S.W.

Welsh Manufacturing Co., Providence, R. I., manufacturer of industrial and welding safety products, announces the opening of its new southwest warehouse facilities at 142 Howell St., Dallas, Texas. Mail address: P. O. Box 10187, Industrial Station, Dallas. Earl Mitterlener is resident manager.

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How To Get Maintenance Supervisors

(Continued from page 25)

foreman then outline his new duties and responsibilities and convey to the new group leader the fact that the promotion is considered an important event both for him and the company.

When the interview is completed the general foreman returns to the department and carefully informs the other employees considered but not selected for this promotion prior to the announcement to all personnel in the department. This is an important factor from both a morale and communications standpoint.

Instruction

For a man to carry out a new job properly, particularly one with more than average responsibility, he needs to know precisely what his duties and responsibilities encompass. This is accomplished

by the general foreman sitting down with the newly appointed group leader and discussing in detail the responsibilities of the job.

Knowing in advance that his job responsibilities specifically include evaluation of current maintenance practices and recommendations for improvements and not just the performance of routine duties, the Group Leader is more likely to contribute to the betterment of the plant and to his own development for future management responsibility. Some of the responsibilities covered are:

1. Assign jobs within his group, based on instructions from his supervisor, in a way that will maintain maximum departmental efficiency.
2. Periodically check work to see that quality standards are being met.

3. Make out time sheets and keep records as directed by the supervisor.

4. Advise the supervisor of any conditions which affect efficiency, quality or safety.

5. Notify the supervisor when conditions are noted which would render operation of equipment hazardous.

6. Advise supervisor of unusual or recurring maintenance difficulties.

7. Maintain cleanliness standards.

8. Make suggestions to the supervisor for improvements in efficiency, maintenance costs and working conditions.

As you can see from the above list and from the accompanying pictures, the duties of the Group Leader give him a variety of experience to qualify him for promotion to supervisory responsibility.



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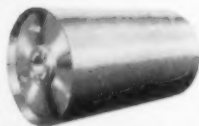


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Effective Scheduling of Shutdowns

(Continued from page 33)

superintendent should determine the work to drop from the schedule, in which case it is always advisable to remove several jobs of short duration. This is due to the fact that maintenance will still have an outside chance to complete some of these small jobs.

When the work to be removed has been selected, the necessary manpower should be dispatched to the unscheduled job. The craft foremen should:

1. Take up the job orders for the cancelled jobs.
2. Review the other jobs in progress for early completion.
3. When a job is completed early, one of these cancelled jobs should be sandwiched in.

Basic Rules

In planning a shutdown, there are certain basic rules the maintenance control department should follow, i.e.

1. Four weeks prior to a shutdown, pull all shutdown jobs from the schedule board for the area or machine affected.
2. Publish a list, describing each job and showing the estimated time for effecting repairs.
3. Contact outside manufacturers' representatives, acquaint them with the tentative date of the shutdown and secure firm commitments on delivery of parts and supplies, or for the furnishing of any technical personnel needed.
4. Continue to accept additional requests for work to be done on this shutdown for one week.
5. Three weeks prior to the shutdown, call a meeting of the management affected for finalizing the work to be done.
6. State in this meeting the maintenance manpower which will be available.
7. Set a number one priority on the "must" jobs.
8. Set lesser priorities on the other jobs, according to their importance.

After this meeting, accept no request for additional work unless the priority is stated and the request bears the signature of approval of the manager of operations.

Call a meeting of the maintenance supervisors for the purpose of determining those jobs requiring prep-work prior to the shutdown. The store's supervisor should be present at the meeting to discuss parts and supplies needed. Those parts and supplies not in stock should be expedited.

The estimated hours on jobs requiring prepwork should be determined. This work should begin to appear on the daily maintenance schedule. The estimated time appearing on the shutdown schedule should be only that time requiring the shutdown of equipment.

If the shutdown is for a major machine such as a paper machine, the departments ahead of the machine will go down earlier and on a staggered basis in respect to their location in the manufacturing process. Under normal conditions, these departments will go down in the following order in our example which is the paper industry:

1. Wood preparation
2. Paper mill
3. Bleach plant
4. Groundwood mill
5. The machine itself

A firm commitment should be received from the superintendent of each of these departments, stating the hour his department will be available to maintenance on the go-down phase. Assemble this information and use it as a basis for scheduling the shutdown.

The start-up time for each department will depend on the work load in that department. In establishing the scheduled working time for certain jobs where limited equipment such as the overhead crane is available, care should be taken to stagger these jobs to avoid conflicts and delays.

Editor's Note:

This explanation of planning is very straightforward and easy to understand. Yet all experienced maintenance heads will recognize it as a big job. Many may disagree

with portions of it. And many will feel they have better methods — particularly for their own type of industry. The editors will welcome comments from other maintenance men in Southern and Southwestern plants . . . and where practical, these comments will be published, and paid for at our usual rates.

F.C.S.

Ten Point Maintenance

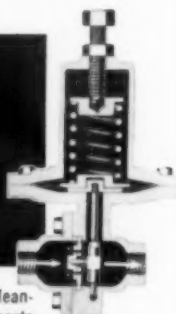
(Continued from page 37)

and the application engineers. The flow of information pertaining to field investigations, machinery case histories, changes in lubrication procedures and new application methods must be maintained between all responsible parties.

A breakdown of communication can be disastrous and prevent the accomplishment of the objectives of the program.

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STEP 9—CONTINUOUS IMPROVEMENT A NECESSITY

The program will be a complete failure if we accept present procedures as the ultimate. Considerable literature has been published on the subject of lubrication and it would take many, many years for any one individual to become an authority in the field.

The lubrication engineer will find the field very challenging because of new lubricants and new techniques being developed day to day. Improvement must be a continuous item on the agenda of the engineer and the paths offering new approaches to any one program may well develop into a new look at the program.

STEP 10—MAINTAIN LIAISON WITH SERVICE ORGANIZATIONS OF REFINING COMPANIES

Many millions of dollars are being expended yearly by the refining companies in their new scientific and research laboratories. They have become extremely aware of the problems which face industry today, tomorrow and for the future. They are constantly searching fields which may be remote to your immediate problem today, but which may well be an answer to an entirely new approach in lubrication tomorrow.

The lubrication engineer today must remain alert and in constant search for new methods and procedures in the interest of maintaining accurate records on the equipment's life, minimum production downtime, reduced inventories, and low maintenance costs.

Conclusion

In conclusion, the challenge is ours, and we should not take it lightly. We have tried here to outline a general approach to a problem which has gained momentum over the past few years and one which has not been taken too seriously by major industry. As the old expression goes, "Thar's gold in them thar hills" and our job is to refine it. It is sincerely hoped that the program we have outlined will assist other industries to take a second look at their lubrication programs.

PATHWAYS OF A PIONEER

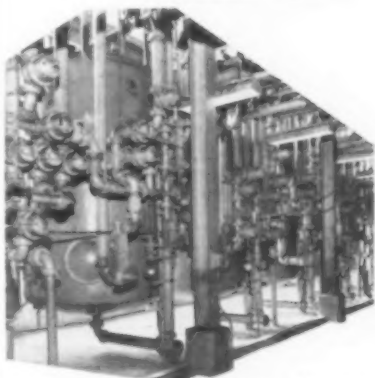


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It is significant that IWT had this early experience in the design of automatic equipment, and so was ready for the widespread trend toward "automation" in many industries in recent years.

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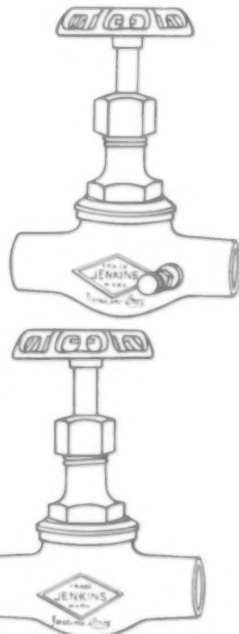
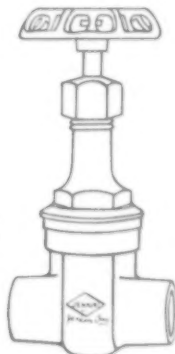
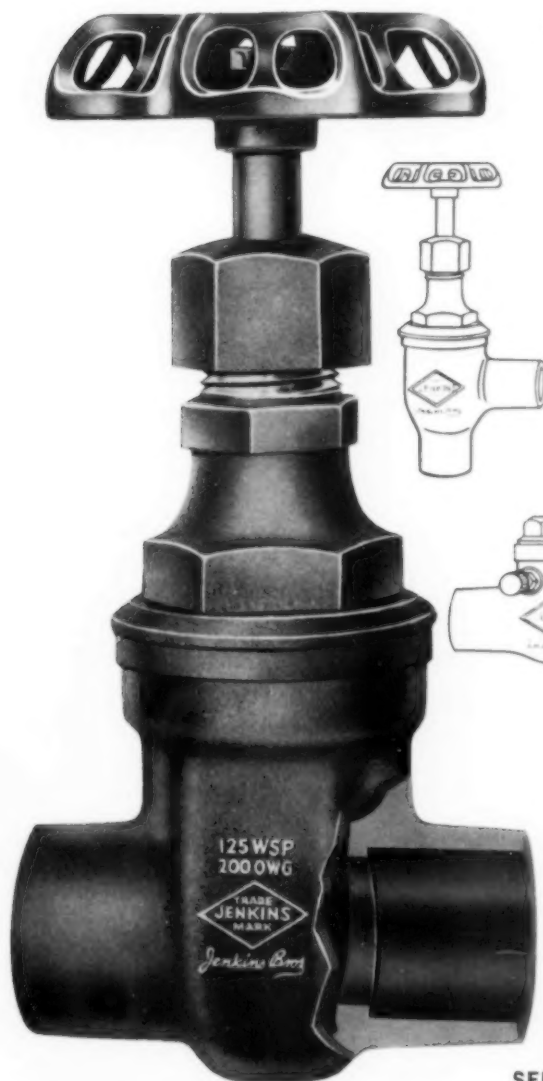
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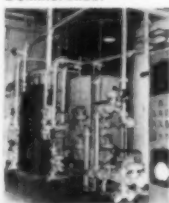


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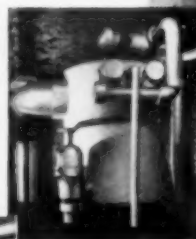


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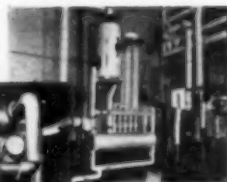
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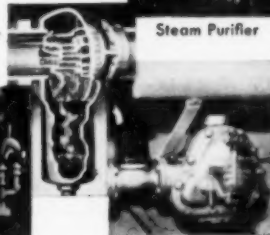
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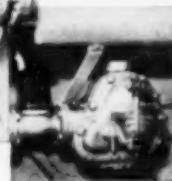
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